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THE COVER: The Camair 480 conversion of a Navion as photographed by W. D. Murdy. See page 56 for further details.

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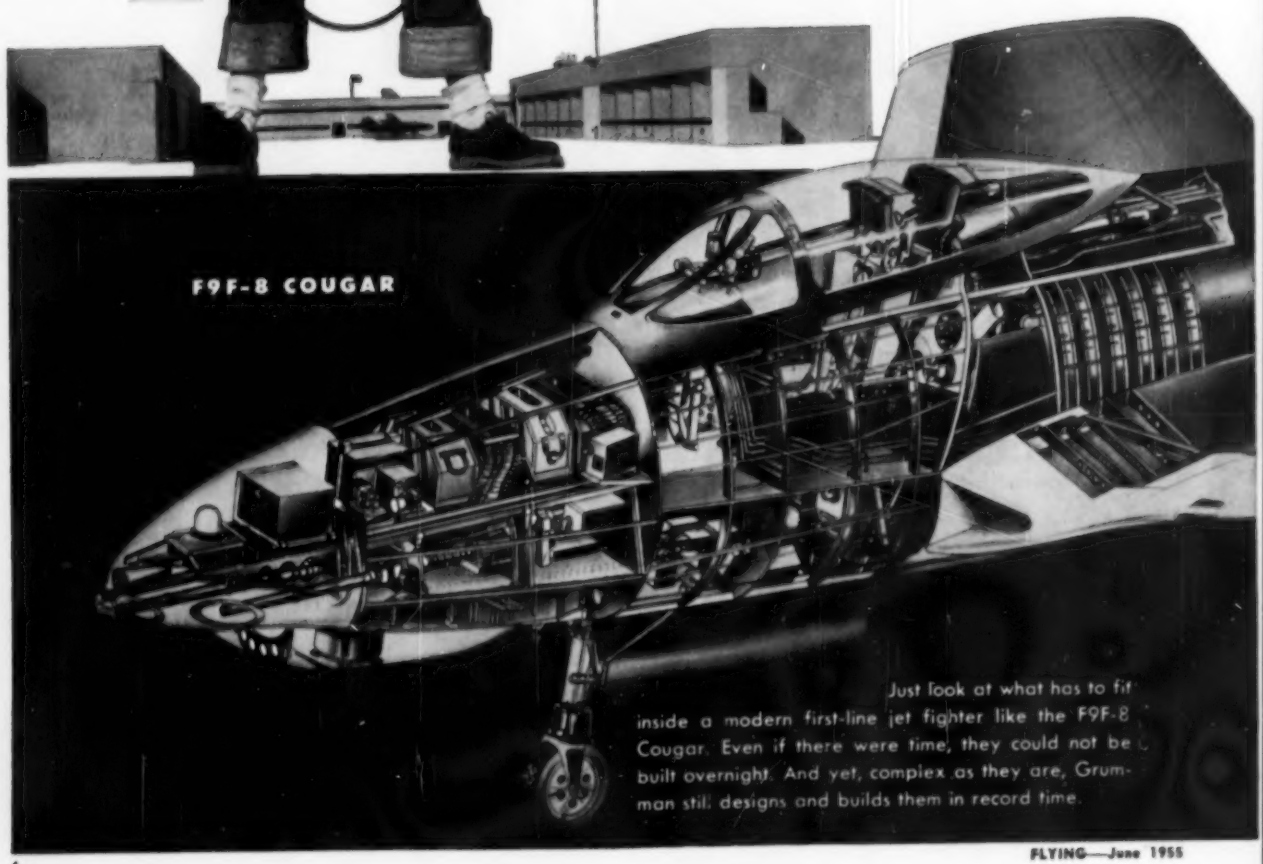

Just look at what has to fit inside a modern first-line jet fighter like the F9F-8 Cougar. Even if there were time, they could not be built overnight. And yet, complex as they are, Grumman still designs and builds them in record time.

If an enemy struck, there would be no time to make riveters of housewives, no time to build over 12,000 fighters as Grumman did Hellcats during World War II. Your government believes we must have the airpower now to defend us and to strike back instantly. We must fight with operational aircraft, not with what is on the drawing boards or flying experimentally. This is why your Navy knows it can depend on Grumman. Grumman planes, designed as much for quick production as they are for speed and performance, are ready in quantity when needed—which is now.

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MAILBOX

MILITARY FLYING CLUBS

I have long been disturbed by the large number of military personnel who are private pilots, but who are not able to pursue their hobby due to the high costs involved. Our civilian counterparts solve this same problem by forming private flying clubs and sharing the expenses. This solution is not generally practical for the military private flier because of his uncertainty as to how long he will be stationed at one place. But it seems to me that if we organize a national flying club among ourselves, we can provide ourselves with low cost flying no matter where we happen to be.

I would be interested to hear the ideas of others on this matter.

CAPT. JAMES A. ROSS, JR.
1107 W. Green St.,
Urbana, Illinois

● *As he has stated, Captain Ross would like to hear from readers on this subject—and so would we. The idea certainly is deserving of serious consideration.*—ED.

CHEERS!

Three cheers for "Tower Talk" in the April issue! Armed with my copy, I no longer need shy away from radio controlled airports. A. Baker's article is receiving lots of favorable comment in this area.

E. A. THOMAS
Portland, Ore.

NEEDED—A SMALL HANGAR

One item I have never seen mentioned in your Mail Box column is the problem of a small hangar for the backyard flyer. It is a real problem to keep a plane protected when you live away from an airport. Hasn't someone come up with a good design for a small hangar that the average guy can build in his back pasture for a decent price—one that will withstand the wind and snow, especially of this part of the country? Perhaps some of the Flying Farmers have discovered a good method. If so, it would be of great interest to see some information about it in your magazine.

DEAN C. GIFFORD
Bingham, Me.

● *How about it, folks? If you know of such a small hangar design, let us have pictures and any information available.*—ED.

PRESSURE PATTERN FLYING

We read Ted Durosko's article, "Ride the Tail Wind" with interest. I am afraid, however, that he gave the impression that you can only fly pressure patterns at altitudes of 10,000 feet and above. Actually, in most cases lower altitudes will work just as well. True, the winds at lower levels will not be as strong in most cases, but the Cyclonic (a Low) or Anticyclonic (a High) flow will usually be more pronounced at lower levels. Chances are that if a similar high pressure cell existed again as in his example, instead of this same circulation holding aloft, it is apt to be more westerly, therefore altitudes 2-4,000 feet on the segment Cleveland to St. Louis would be faster than at higher levels.

C. L. CHANDLER
Professional Member
American Meteorological Society
North Babylon, N. J.

BACKWARD BEAVER

. . . I would like to compliment you on the cover of the April issue (de Havilland *Beaver*). However, unless I'm very mistaken, the wrong side of the negative was developed, resulting in numerous

errors in the picture such as having the exhaust on the left side instead of the right.

I am a crew chief on an L-20 *Beaver* here at Fort Hood and have a lot of respect for the capabilities of the plane. Enclosed is a photo of my L-20 and myself parked on our tie-down ramp here at Fort Hood.

PFC. LAUREN D. BASHAM
Fort Hood, Tex.

● *Well . . . that's the first and last time we'll be taking "artistic license" with an airplane! We did it to achieve good cover composition and hoped no one would notice. The flood of mail we have received from all over the world—pointing out our error—not only indicates the care with which many readers study the covers, but is also a fine testimony to the* Beaver's *world-wide popularity.*—ED.

HAIRY STORIES

The story in the February issue, "Bewildered Bear" by William M. Jones, Jr., gave me a real good laugh. I knew Bill

and Alex right after the war when they were operating an aircraft repair shop in Renton, Wash. Alaska flying in small planes is nothing new to either of them because I can remember many occasions in which lengthy preparations were made to ferry a J-3 *Cub* or an Aeronca *Champ* from Seattle up into southeastern Alaska. The best part of those trips always seemed to me to be the hairy stories they had to tell on their return to Seattle. In this case, I am surprised they didn't land near the bear just to see if bears are really as mean as everyone says they are.

GEORGE NOTTINGHAM
Guatemala City, Guatemala

THE AIRMAN'S PEACE

Gill Wilson has advanced a most laudable proposal in nominating airmen of the Free World for the Nobel Peace Prize and I second the motion.

WARREN G. MAGNUSON
United States Senator
Washington, D.C.

As a newspaperman of 27 years' experience, I am sure I know fine writing when I read it. And as a businessman flyer of 16 years, I like to see credit given to an activity which sometimes is tragically overlooked. You have accomplished both in your splendid topic, and I am sure your words are going to be read and felt by many thousands of people.

ROBERT L. HARBISON
San Bernardino, Calif.

. . . I could not help but admire this voice that seemed to be an echo from the past. It is seldom that anyone these days has the courage, or takes the time to speak out in behalf of the private flyer.

HUGH C. ROBBINS
Los Angeles, Calif.

STRICTLY FOR THE BIRDS

While reading a recent issue of FLYING, which I read from cover to cover, my "flying instructor" showed considerable interest in your publication. My title to the picture: "I Learned About Flying From That!"

DAVID STERNBERGH
York, Pa.

Thought you might like to see the tame crow named "Heckle" which has been raised since it was four weeks old by Ralph I. Dietrick, owner and manager of Sky Tours, Inc., in Sandusky.

DON C. WIGTON
Ferndale, Mich.

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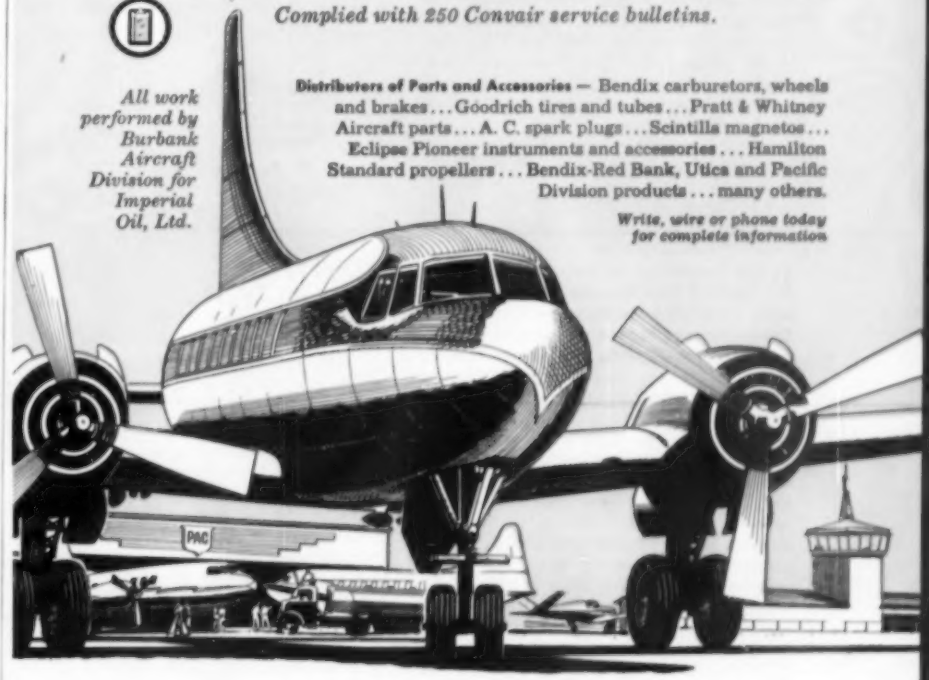

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Briefings . . .

PHILADELPHIA INTERNATIONAL Airport will be the site of the 1955 National Aircraft Show over the Labor Day weekend, Sept. 3 through 5. Substantially the same type of show as put on at Dayton so successfully for the past two years, the 1955 event will include static exhibits of current production and research aircraft, flight demonstrations by the armed forces, and numerous other events.

HELICOPTER FIRE TRUCKS with the latest in fire fighting equipment have been proposed by Piasecki Helicopter Corp. The artist's conception shown here indicates how a firefighting Piasecki H-21 would extinguish fire of a damaged bomb-

er which came to stop after landing in a swampy area adjacent to the runway. Note the airport fire truck bogged down in the swamp and the helicopter crew member in asbestos suit being lowered by rescue hoist to help crew members of the bomber escape.

MIGS MAY BE FLOWN BY FINLAND if recent reports of negotiations with Russia prove reliable. They have a number of British de Havilland *Vampires* in service.

RECONFIRMATION OF AIRLINE reservations will not be necessary after June 15 on most scheduled airlines. The Air Traffic Conference of America has voted to repeal the reconfirmation rule, thus leaving each carrier free to continue or discontinue reconfirmation at its own discretion.

COLOR RADAR is now undergoing tests by the military services and may be the answer to assisting radar operators in sorting the blips traced on their screens. The new color radar indicates aircraft flying at high altitudes as bright orange dots traveling over chartreuse colored land areas. Planes flying at lower altitudes show up with a more greenish hue.

FLETCHER'S ICE ISLAND, the floating ice island in the Arctic Ocean and otherwise known as T-3, has been reoccupied, this time by an Air Force scientific research party. The island was abandoned last spring as a weather station when it floated too close to another weather reporting area. The new party, headed by Albert P. Crary, geophysicist from the Terrestrial Sciences Laboratory, includes Norman Goldstein, also of the Terrestrial Sciences Laboratory, and Charles Horvath, marine biologist of the Allan Hancock Foundation, University of Southern California.

RUSSIAN MISSILE-LAUNCHING sites and underground hangars are reported to be under construction on Sakhalin Island, about 1,000 miles north of Tokyo.

AIRCRAFT USING LA GUARDIA Airport after May 1 of this year will be required to have two-way radio capable not only of communication with the control tower on VHF but also with ground Control on 121.7 mc.

FOURTEEN-COUNTRY COOPERATION in the NATO set-up leads to some strange situations. Today a pilot of one country may fly a plane built by a second country, financed by a third, using as his base an airfield constructed on the territory of a fourth by a firm from a fifth, drawing his fuel from a NATO pipeline.

EN ROUTE TO NEW ORLEANS where they will be disassembled for freighter shipment to South Korea, these three

Cessna 180's are headed for service with the South Korean Air Force, which took delivery of three others last year.

A TYPICAL PRE-WORLD WAR II airplane cost $11,785 at that time. Expressed in terms of today's dollar value, this plane would cost about $23,570. However, the equivalent plane rolling off the production lines now costs $12,950 and includes many features found only on commercial airliners just a short while back.

JAMES STEWART WILL PORTRAY Charles Lindbergh in "The Spirit of St. Louis," a Leland Hayward film production of Lindbergh's own Pulitzer Prize story. Filming will start in Paris this summer, with LeBourget airport recreated as it was the night the "Lone Eagle" made his triumphal landing in the French capitol.

AT LONG LAST, a counter altimeter is in the works. Racking up thousands of feet in the counter window and indicating hundreds of feet by needle, the new altimeter automatically takes the guess work and human error factor out of reading altitude indications. For ex-

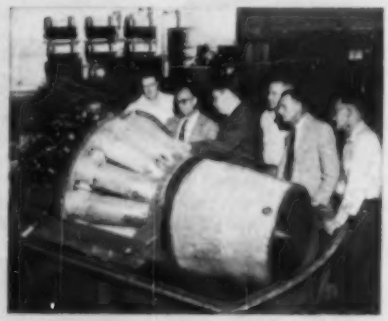
ample, at 23,040 feet, the pilot would see the number 23 registered on the counter and 40 would be indicated by the pointer. Developed by Kollsman, the new instrument is pressure-actuated. Numerous engineering difficulties requiring some six years to overcome have preceded the original order for 500 placed by the Navy and Douglas Aircraft.

DECOY RADIO NAVIGATION BEAMS are said to be in operation in Red China to throw U. S. aircraft off course and make them vulnerable to attack over Red territory.

AN INVALUABLE COLLECTION of pioneer aviation materials has been donated to the Air Force Museum at Wright-Patterson Air Force Base, Dayton, O., by Glenn H. Curtiss, Jr. The collection is composed of 2,500 items including photographs, trophies, and original sketches of inventions as well as components of early Curtiss aircraft.

NORTHROP AERONAUTICAL INSTITUTE of Los Angeles reports the placing of 100 per cent of its mid-year Aeronautical Engineering graduating class.

BLAZING ANOTHER TRAIL for fixed-base operators, Southwest Airmotive has received the first contract to overhaul Air Force jet engines ever awarded a



non-manufacturing commercial fixed-base operator in the United States. The $3,000,000 contract calls for overhaul of more than 1,200 Allison J-33-A35 turbojet powerplants and their accessories.

(Continued on page 12)

FLY WEATHER-WISE

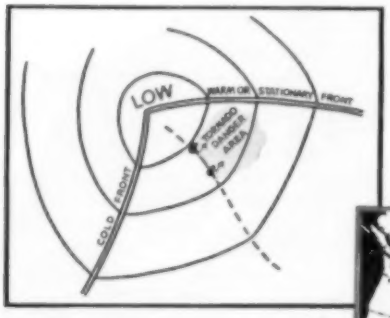
These weather items prepared in consultation with the United States Weather Bureau

TORNADOES

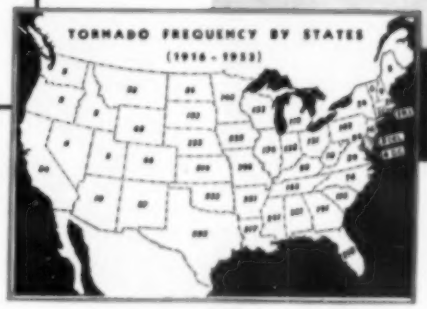
Here's helpful information for every pilot on these dangerous, spiraling windstorms.

Watch to the West—Tornadoes are local in origin and hop and skip as they travel. They nearly always move E to NE, so keep an eye to the West for funnel-shaped clouds. Since these wind formations are so localized, they may be avoided by careful observation during the day.

Another safeguard which should be utilized is the Weather Bureau "Severe Weather Forecasts." Using advanced techniques, they give warning of the danger areas where destructive thunderstorms or tornado formations are likely. Watch for these warnings on your weather teletypewriter circuits and listen for them on your radio.



When tornadoes occur, they nearly always develop in the warm sector of a low-pressure area between the cold front and the warm front. The weather map indicates the area of potential danger. Note the location of the two tornadoes on the map above.



Although many pilots may not realize it, tornadoes occur in *every* part of the United States, as the map at left shows. They are also common in many other parts of the world.

MAP COURTESY OF U. S. WEATHER BUREAU

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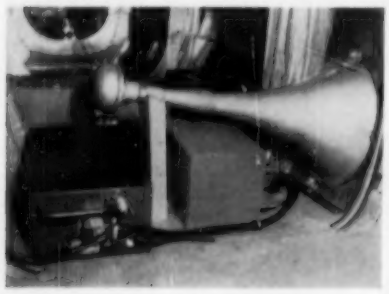
Briefings . . .

(Continued from page 10)

Still in half its metal shipping drum, the first jet to arrive at Southwest for overhaul is shown being inspected by officials of the Dallas firm and Air Procurement District officers.

BY A FLIP OF THE SWITCH, the pilot can be heard distinctly from altitudes as high as 3,000 feet when this audio amplifier and speaker are built into the baggage compartment. The U. S. Border Patrol recently took delivery of a Cessna



180 with this installation. Previously they used Cessnas with the speaker on the outside, altering the configuration of the plane and causing unnecessary drag when in flight. No appreciable volume is lost due to the inside mounting of the equipment.

MAN-MADE SPACE SATELLITES could be used as a means of relaying television across the ocean, according to Dr. John R. Pierce, director of electronics research of Bell Telephone Laboratories, who states that a 100-foot satellite in an orbit 22,000 miles about the earth could reflect television signals from one continent to another.

REMMERT-WERNER'S *News-Press-Times-Dispatch-Herald-Chronicle*, which is "published every once in a while," quotes one, Hank Haddock, as saying: "Flying is just a matter of hours of boredom broken by occasional moments of stark terror."

AN AUTOMATIC RUDDER CONTROL for business-type aircraft developed recently by Globe Industries, Inc., of Dayton, will be marketed by the Commercial Aircraft Products Department, a newly established division of the company. Globe also produces miniature electric motors, gyros, actuators and other items used in military aircraft and missile applications. Sidney M. Gamsu has been appointed Sales Manager of the new department.

SIR ARNOLD HALL, director of Britain's Royal Aircraft Establishment at Farnborough, predicts that airliners of the future may be built of glass-fiber reinforced plastic which is cheaper and lighter than aluminum and singularly free from metal fatigue.

A SIMPLE LEFT-RIGHT NEEDLE, with no 180 degree ambiguity, provides direction finding through any GE, Bendix, Narco, or Hallicrafter low frequency receiver. Current drain is so light that the unit will operate well on a flashlight battery. The manufacturer, Aircraft Specialty Lines, estimates maintenance-free periods of about four years in normal operation. Price is $195. The company address is: 10200 N. 19th Ave., Phoenix, Ariz.

PILOTS WANTING TO VISIT Cypress Gardens and Bok Tower at Winter Haven, Fla., will now be able to secure Hertz Rent-A-Car service at Winter Haven Gilbert Airport. The field has 4,000 ft runways and clear approaches.

AIRCRAFT RADIO CORPORATION has acquired Orion Industries, Inc., of Richmond, Va., developer and producer of a line of aircraft flight instruments and navigation computers including the Compass Slaved Gyro and the Course Director. The transaction involved the Orion products, its research and development facilities and personnel.

ONE AIR FORCE FLYING TANKER squadron transferred more aviation gas (563,273 gallons) in 16 flying days of aerial refueling operations than the average automobile service station would pump in three years.

TEXAS A AND M. COLLEGE will conduct a school for agricultural pilots next fall. Only such school in the country, the program calls for a six-weeks course, with at least 30 hours of flight training. Total cost, including room and board, is expected to be about $500 per student. Applicants must have a commercial pilot license, will be screened by the Texas Aerial Applicators Association as well as the college.

ROUTINE DELIVERY FLIGHTS of Piper *Apaches* are becoming global in nature. Recently Mr. Piper saw his sons William

T. Piper Jr. (left) and Howard Piper (right) off on a delivery flight to Pretoria, South Africa. The 12,500 mile trip included an 1,860 mile over-water hop across the South Atlantic from Brazil to Monrovia. The plane was a standard production model with the exception of extra Lear radio equipment and 200 gallons

(Continued on page 14)

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At DOUGLAS you'll be associated with top engineers who have designed the key airplanes and missiles on the American scene today. For example:

DC-7 "SEVEN SEAS" *America's finest, fastest airliner*

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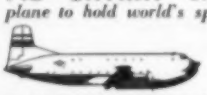
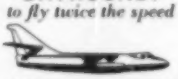


C-124 "GLOBEMASTER" *World's largest production transport*

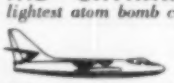
NIKE *Supersonic missile selected to protect our cities*

"SKYROCKET" *First airplane to fly twice the speed of sound*



A3D "SKYWARRIOR" *Largest carrier-based bomber*

A4D "SKYHAWK" *Smallest, lightest atom bomb carrier*



B-66 *Speedy, versatile jet bomber*

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U. S. Navy's new fighter

surpasses speed of sound—

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—the Douglas F4D Skyray

The pilot was seeking no record. But suddenly, his *production model* Douglas F4D Skyray was flying faster than the speed of sound *in level flight!*

Though this supersonic show of speed was unscheduled, it came as no surprise. Skyray is holder of the world's official F.A.I. sea-level speed record at 753.4 m.p.h. Designed for interceptor duty with the U. S. Navy, it is powered by a Pratt & Whitney J-57 engine with afterburner. Agile as well as fast, Skyray has a very high rate of climb and low landing speeds—operates with ease from aircraft carriers... to strengthen the fleet air arm.

The outstanding performance of F4D Skyray is another example of Douglas leadership in aviation. Faster and farther with a bigger payload is always the basic rule of Douglas design.

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Depend on *DOUGLAS* **First in Aviation**

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Scott OXYGEN CONSOLE

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Only 7½x8x1½" 3 lbs.

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Also available at other Scott dealers and distributors . . . or write for complete information. Give make of aircraft.

Typical 4-place installation

Scott OXYGEN CONSOLE	$149.50
Masks, tubing, connections and oxygen cylinder	111.00
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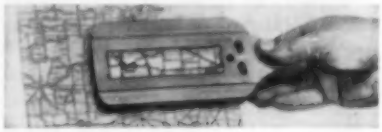
Briefings . . .

(Continued from page 12)

of extra gas to give the ship a 2,700 mile range. Six more *Apaches* are scheduled for fly-away delivery to South Africa this summer plus several others to Europe.

ROYAL NETHERLANDS Aircraft Factories, manufacturer of the Fokker F-27, a high-wing turbo-prop transport powered by two Rolls Royce *Dart* engines, has applied to the CAA for a U. S. Type Certificate on the new plane. Fairchild has been granted rights to build the F-27 in the U. S. and to sell it everywhere in this hemisphere except Brazil.

HAVE TROUBLE READING the fine print on your air maps? This "Trail Gazer" may be just the gadget for you. Squeeze the jaws open, slip it over the part you want to magnify—and there you are.

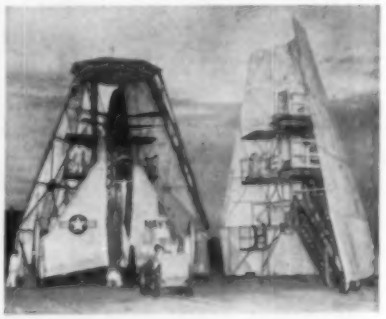


There is some distortion at the edges but magnification of words and numerals is accomplished. The lens is unbreakable lucite and the rest is enameled metal. Price $1.00 from Leybourn Specialties, 2105 Adams St., Toledo 2, Ohio.

SOVIET STATE SECURITY FORCES are reported to be training in the use of radioactive warfare in Central Asia. Atomic weapons in the hands of Soviet police may be insurance against slave-camp uprisings.

THE POPULAR ANNUAL Maintenance and Operations Meeting sponsored by Reading Aviation Service at General Carl A. Spaatz Field, Reading, Pa., will be held this year on June 4. The sessions are open to all pilots and aircraft owners who wish to attend.

SMALLEST HANGAR ever designed for a Navy plane, the 36-foot-high tepee-shaped hangar was built in two sections to conform to the shape of Convair's



XFY-1 *Pogo* vertical takeoff fighter. In addition to providing protection from the weather, the tepee-hangar gives ground crewmen protected platforms from which to work on any part of the plane.

Everything you want...

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YOU'LL FIND IN THE **Piper Tri-Pacer 150**

SIMPLIFIED CONTROLS coordinate rudder and ailerons automatically, make flying as easy as driving a car. This feature is a Tri-Pacer exclusive in its class.

TRICYCLE LANDING GEAR takes the skill out of landings, improves handling in high winds. It's the modern gear, a Tri-Pacer exclusive in its class.

150 HORSEPOWER Lycoming engine, recognized as one of the finest aircraft engines ever built. Here is your assurance of dependable, economical power.

PIPER DURACLAD construction. Bridge-like fuselage and wing structure are covered with Piper non-flammable Duraclad, tough, durable finish.

QUIET, BEAUTIFUL INTERIOR for travel comfort. You travel in style and comfort in the Tri-Pacer 150 thanks to deep-cushioned seats, excellent sound-proofing and ample warm and cool air systems. Individual front and rear doors plus separate baggage door are exclusive Tri-Pacer features.

Flight-planned instrument panel provides plenty of room for full instruments and radio.

PERFORMANCE PLUS! Now with 150 horsepower, the Tri-Pacer 150 has remarkable short field ability, wonderful rate of climb and cruises 132 mph at optimum altitude of 7000 feet.

You get all this for far less cost than any other production 4-place plane. See and fly the Tri-Pacer 150 at your Piper Dealer's and ask him about the Piper "Learn-as-You-Travel" program or write Piper Aircraft Corporation, Lock Haven, Pennsylvania, Department G-6.

PIPER

AIRCRAFT CORPORATION

LOCK HAVEN, PENNSYLVANIA

FLYING
VOLUME 56, NO. 6
JUNE, 1955

AN EDITORIAL

Up Against Biology

IN November, 1783, Benjamin Franklin watched a Montgolfier balloon drift over Paris and commented that flying would some day change the course of human affairs.

On a recent evening I fell asleep cogitating the satisfaction Mr. Franklin would feel if he could slip back to modern times and see how nearly he had hit the nail on the head. Slumber leading to dreams, I found myself taxiing up to the ramp at Wings Field, near Philadelphia. The Sage of Rittenhouse Square was waiting to greet me.

Completing my check list of switches to be cut, valves to be closed, and log books to be filled out, I finally hurried to greet Mr. Franklin.

The old statesman eagerly inquired, "Prithee, tell me, how dost thee utilize yon vehicle?"

"Its genius is speed," I said. "In it I go rapidly from this airport to some other airport. I come here from home in an automobile and am met yonder by another automobile to complete my journey."

Before I could continue, Mr. Franklin interrupted, "Thus thy pocketbook is ever in double jeopardy. The first cost of thine airplane is the price of thine automobile. Hast contemplated modification of the vehicle for certain use on the highroad? Thee could save time and nurture thy purse, and surely gain much convenience."

I saw that the old boy was terribly behind the times. Such words as economy and convenience are never used in polite aviation circles. I said to him, "You came here to assess the wonders of progress. All right, let's stick to that subject."

But he was not to be diverted. "Why the need of yon vast acres?"—letting his eye roam over spacious Wings Field. "Why must thy steed gallop so far before lifting his load? The Wright Brothers would be displeased."

"Now just a minute, Mr. Franklin," I expostulated. "Aviation evolved in the tradition of the Wright Brothers. They did it this way."

"They did no such thing," he stormed. "The Wrights made progress. Thee dost make only complications. Tradition indeed! A great word! A living word! A pox on thine idea of progress. Thee hast subverted every worthy element of progress—economy, convenience, appeal to mass utility. Thee art in the *habit* of the Wright Brothers, but emphatically not in their tradition."

Seeking escape from the Franklin ire, I led the famed inventor to the cockpit, and forthwith launched on an explanation of the gauges—gyro compass, turn and bank, air speed, sensitive altimeter, artificial horizon, glide path indicator, marker beacon, DME, ADF, etc.

I showed him about the controls and trim tabs, the flaps and reversible props, the engine synchronizers, fuel analyzers, cylinder head temperatures, the automatic pilot and hydraulic gear devices, the fire warning thermocouples and the entire range of engine instruments, electrical, mechanical and hydraulic.

I worked a few computers for him and let him leaf through my tech manuals and Airway Manual and Airman's Guide. I went into communications and really outdid myself—multiple frequencies, modulations, intercom, loran, shoran, radar fix, et al. I let the old boy have the works and wound up by telling him I needed airborne radar for turbulence detection.

Then I sat back to hear his reaction. I could see his excitement growing. What a scoop for FLYING would be his words of astonishment . . . and his own old paper, the Saturday Evening Post, asleep at the switch just a few short miles away!

At last he spoke. "Gill, when I saw that balloon go up over Paris, I told Lou and Tony—Louis XVI and Marie Antoinette—that aviation might some day change the course of human events.

"I confess to thee now that I was far short of seeing what indeed would take place. I was a dodderer, an old fogy, a visionless yokel!

"But while thee described the functioning of this vehicle, I at last saw the light, and I have calculations for thy consideration. Look, my friend, aviation will not merely shape the course of human events. It will reshape humanity itself! The problems of the air age are beyond technology and have progressed to anthropology. My computations show that, to operate this machine adequately, a pilot should have seven arms, five legs, nine ears, a ring of eyes around his head and eleven different nervous systems!"

My mouth dropped open. I sat flabbergasted. Then a little bell began to ring in the back of my head. Suddenly I saw that Mr. Franklin was right. Complications had driven the air age to the wall. Progress was a dead duck unless we could biologically create multi-functioning pilots.

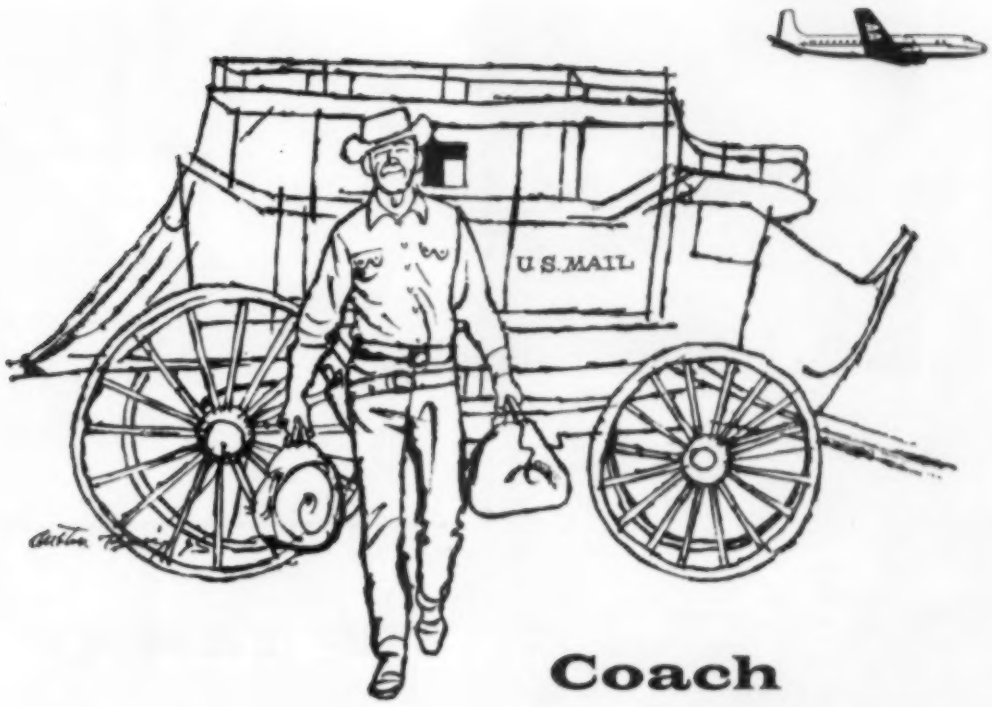
"Mr. Franklin," I said, "you are the answer to prayer. The Wright Brothers would have passed into history as a couple of guys with a bum idea had you not come along to raise the ceiling."

"Thee art kind," he said, "very kind, brother Gill. Mayhap thee canst influence thine industry to greater simplicity in view of the biological alternative."

"Forget it, Ben," I said. "It's easier to tackle the anthropology racket."

Gill Robb Wilson

Gill Robb Wilson
Editor and Publisher



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The Camair *Twin Navion* features tip tanks.

Factors which should be considered concerning external fuel tank installation on civilian aircraft

By DR. KARL FRUDENFELD

TIP TANKS FOR

Tip tanks are an integral part of Cessna 310 design.

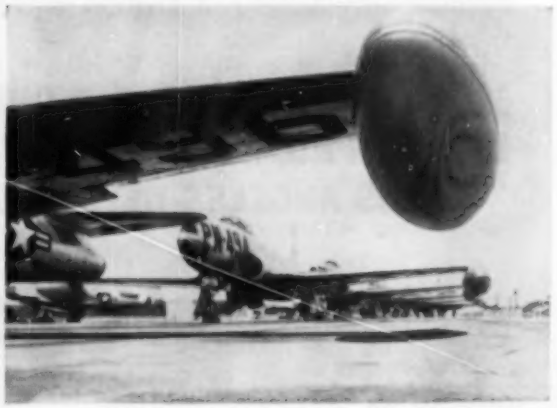
Tip tanks holding 600 gallons each are optional equipment on new Lockheed *Super Constellation*.

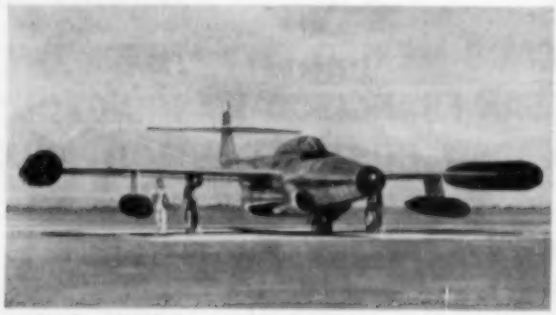
IN THE LATTER STAGES of World War II, external fuel tanks were devised to increase the combat radius of military aircraft. The practice proved sound and added greatly to the effectiveness of airpower.

What more natural then that civilian owners of personal and business planes should be intrigued. If nothing else, the "eye appeal" was an incentive and stories of better performance . . . in some respects true . . . insured the tip tank a place in hangar talk.

But likewise there was a hard core of incentive in the evolution of external fuel cells . . . mainly longer range and greater safety. Several companies and individuals began broad scale investigation of the subject. Most backed off because of the cost of research. Some persisted. Appearance of the Camair *Twin Navion* and

Lockheed F-80B *Shooting Star* was first jet to utilize tip tanks.





Northrop F-89D *Scorpion* increases range with jettisonable fuel tanks mounted under wings. Note rocket pods on wing tips.

Navion showing Brittain tip tank conversion.

Cessna "310" stimulated interest. Brittain Aircraft Enterprises further whetted appetites with the *Navion* Tip Tank Kit. Inquiries have poured in to the latter from owners of almost every type of personal plane, including dusters. There can be no doubt of the extent or avidness of interest in the subject.

In view of this situation, some discussion of the entire matter seems in order. We need concern ourselves little with the newer models specifically designed for tip tanks, and shall concentrate mainly on the "tipless" existing fleet.

Anything that increases safety may be considered a necessity. Outboard location of fuel removes most of the fire and fume hazard of a leaking tank and places fuel remote from vital areas in the event of forced landing.

Increased range may or may not be a real need. If hourly fuel consumption is high relative to primary fuel capacity, then the need for auxiliary tankage becomes absolute. If primary fuel supply is on a par with the endurance of the average pilot, then additional fuel becomes a burden.

World War II P-47 *Thunderbolts* used jettisonable auxiliary gas tanks mounted under wings.

If operating range restricts a plane to a given weather zone, then increasing the range may be a hazard. CAA points out that certain civilian aircraft with unusually long range are most frequently involved in "weather" accidents. On the other hand, there are many instances where basically long-range aircraft, and those whose range has been extended by auxiliary fuel supply, have successfully circumnavigated weather.

The ability of an aircraft to handle additional fuel must be calculated. Fuel-to-oil ratios, currently given as 40 gallons of useable gas to one gallon of useable oil, is a ratio enforced by CAA to help prevent a hopeless situation of plenty of gas but no oil. Limited deviations from this ratio may be obtained.

Another factor to consider is payload. An extreme could be reached where, fully gassed, an airplane would sacrifice its utility in great measure. On many aircraft, the addition of a reasonable amount of auxiliary fuel works no particular hardship, except perhaps from the standpoint of an unfavorable distribution of weight in respect to center of gravity. In this latter respect, properly situated wing tip tanks can apply all of the auxiliary fuel load directly to the center of gravity. In all instances, it would be desirable to increase the allowable gross weight proportionate to increased fuel load. This, as will be brought out subsequently, becomes quite involved.

Perhaps the most pertinent consideration is the wing itself. With a given quantity of fuel expressed in terms of weight, it must be determined what forces will develop within the wing under various operating conditions. The basic wing loading and bending (*Continued on page* 72)

MAMBA!!!

An unwelcome passenger on a flight

10,000 feet above the African veldt, a dreaded Black

Mamba terrorized the pilot and his navigator

By DICK RICE

As told to Michael Sheldon

ILLUSTRATED BY ED VALIGURSKY

HAVE YOU EVER been gripped by fear? Not just a momentary fear that passes when common sense relaxes your muscles and forces you to action; but stark terror that pops stinking sweat from your pores, makes your eyes bulge in your head and your heart pound to bursting.

If you have ever sat defenseless within striking distance of a Black Mamba, you will know fear as, thank God, few men ever do. Of all the deadly snakes in the world, I have yet to hear of one deadlier than the dreaded Black Mamba of Africa. It is one of the unhooded members of the cobra family and, although not so large as the Asiatic King Cobra which may be from 14 to 18 feet, it is a big powerful snake and strikes with the speed of a bullet. Its poison is said to paralyze in a few seconds and kills in a few more.

At 0545 hours last July 22, I walked over to my Fairey *Battle* aircraft in Southern Rhodesia and soon was at 5,000 feet above the African Veldt, heading east. This was to be my last flight before leaving for Kenya to patrol against the Mau Mau terrorists, and I thought it was a good opportunity to work out with the Fairey *Battle*.

I had little experience with these planes, although I was an RAF pilot during the war, flying first the *Hurricane* and later the *Spitfire*. After the war, I drifted around until I wound up in Rhodesia as a pilot. The job was tame, however, and when I learned that pilots were wanted to operate against the dreaded Mau Mau, I applied for a job, and got it.

My navigator this morning was Tommy Milton, a youngster from Bulawayo, Rhodesia, but he was far back in the plane trying to fix the intercom which had gone out of operation because of a frayed wire.

I was climbing steadily to see whether the Fairey could get to 15,000 feet—which I doubted. I wanted to get altitude and come into a dive for practice.

It was at that moment I sensed something behind me.

"Got everything fixed okay, Tommy?" I asked, thinking that it was my navigator.

When I got no reply, I glanced back. My blood froze. Reared on its coils close behind me, its head poised to strike, was a big Black Mamba! I still had the plane in a fairly steep climb, but the incline seemed to have no effect on the snake.

I did not at that moment wonder how it got into the plane. Later I realized that the plane had been parked on the tarmac all the previous night and that the black terror must have crawled in through the open hatch and sought warmth on the pile of nylon target sleeves that lay close behind my seat—sleeves we used to pay out as targets for pupil airgunners.

I sat paralyzed with fear. Sweat began to burst from my pores with an overpowering stench. The cockpit stank of it; it seeped into my oxygen mask with its half-pressure setting and began to make me nauseated. I wanted to vomit.

I tried to take my eyes from the coal black head that swayed within a foot of my face and the twin-pronged tongue that darted left and right as the snake's eyes focussed on mine. I found I could not take my eyes from the Mamba's. I was in a state of spastic paralysis.

I tried to think about the intercom. If I could get hold of Tommy, he could come up behind the snake and batter it with something. We had no guns on board, but there were iron rods and a hammer.

But I dared not move my hand to get the intercom, even assuming that it was working. I felt that the moment I made a move the snake would strike. I dared not push the control to tip the machine over, in hope of unbalancing the snake, and giving myself a chance to kill him. Tommy would not expect such a maneuver and might get seriously hurt or bitten.

I eased on the control column and took my eyes from the snake, expecting to feel its fangs in my unprotected arms or neck at any moment. In Rhodesia we fly in khaki shorts and khaki shirts, owing to the heat. My arms were bare too, but even so, the shirt and singlet I wore would prove no protection against the snake's fangs.

I saw that we had reached 9,950 feet. I wondered what Tommy was doing, hadn't he finished yet? Then I heard the crackle of the intercom.

"Can you hear me, Dick?" he (*Continued on page 62*)

Paul Mantz (left) and Robert L. Benedick, the co-producer of "This Is Cinerama," examine the three-eyed camera covering a range of 146 degrees which is installed in Mantz' B-25 (top).

CINERAMA WINGS

Skilled pilotage and special equipment are needed to get incredibly thrilling movies.

By GLENN INFIELD

THE CONVERTED B-25 with a huge round bump sticking out ahead of the cockpit looks like a flying penthouse but it and the man in the cockpit have produced a kaleidoscopic, multidimensional picture of the wonders of the world that has thrilled over 5,000,000 people. The man is Paul Mantz; the "bump" is the 200-pound, three-eyed camera that produced "Cinerama."

Aerial photography has long been an important part of the aviation industry. During war or peace, the high-flying photo pilot has been doing an important job for the military services and civilian industry. But the advent of the new 3-D camera has revolutionized one phase of aerial photography overnight; that of movie making.

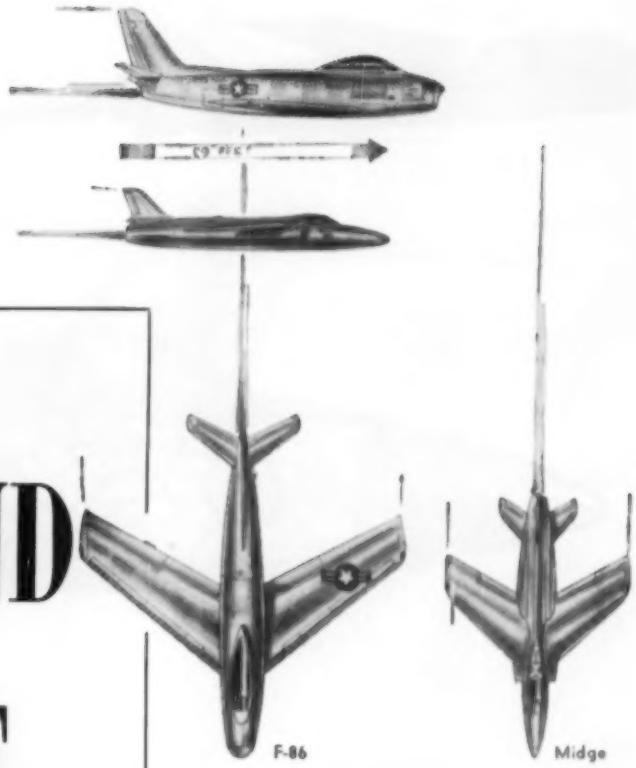
Lowell Thomas and Merian Cooper decided that an important part of the first Cinerama would be an aerial tour of the United States. They decided too, that to get the best "shots" they would need the best pilot in the movie industry. That would, of course, be Paul Mantz. In turn, Air Force pilot, transport captain, forest ranger and stunt pilot, Mantz also won the Bendix Trophy three times in a row and holds the record for the most consecutive outside loops.

Commissioned to "bring America back alive," Mantz did just that by lashing the three-eyed camera to the nose of the B-25 and heading for Zion National Park in Utah. With a range of 146 degrees horizontally, virtually that of human vision, the new camera got some spectacular shots of the most treacherous flying area in the country. Obviously, Mantz had brought his plane right down to the level of the rugged peaks to get his pictures. But co-producer Cooper, a veteran airman himself, was not satisfied. He sent Mantz a telegram that said simply, "How's the weather up there?"

Mantz went off like an atom bomb. The next shots that arrived at the laboratory in Oyster Bay, L. I. were so dramatic that even Cooper gasped. Mantz had dived down inside the twisting canyons where no man before had flown and had taken pictures that were later to make people all over the world catch their breath.

It not only proved Mantz a pilot but also opened a new segment of movie-making. Since those first test-shots, Mantz has flown the length and breadth of this country and the results are incorporated in the first Cinerama production. Lately he has taken his camera-studded plane abroad, recording additional film for forthcoming productions. He has made aerial shots of London, Rome, Paris, the Swiss Alps and has covered South America from dry desert to steaming jungles. This film will give millions of people a three dimensional bird's-eye view of places they will never get to see otherwise. They will roar over the Taj Mahal, skim the Himalayas and lazily circle the South Sea Islands all for the price of a movie ticket. END

Right: Two views comparing Folland *Midge* with the three times heavier F-86 *Sabre*.



FOLLAND MIDGE

The British have developed a new class of military weapon in this tiny tactical fighter-bomber.

By THOMAS TURNER

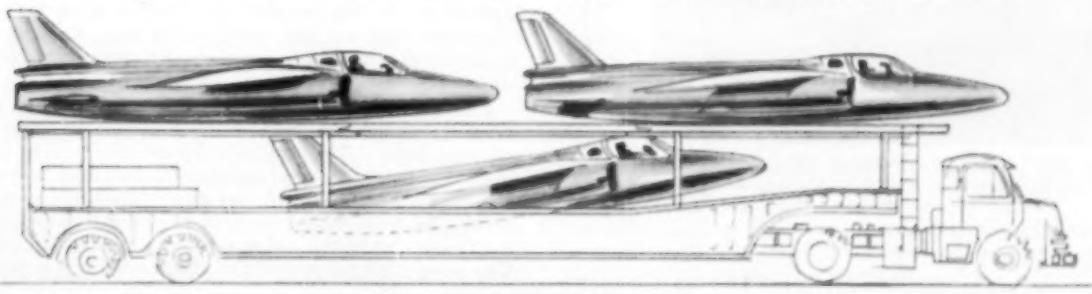
ILLUSTRATIONS BY THE AUTHOR

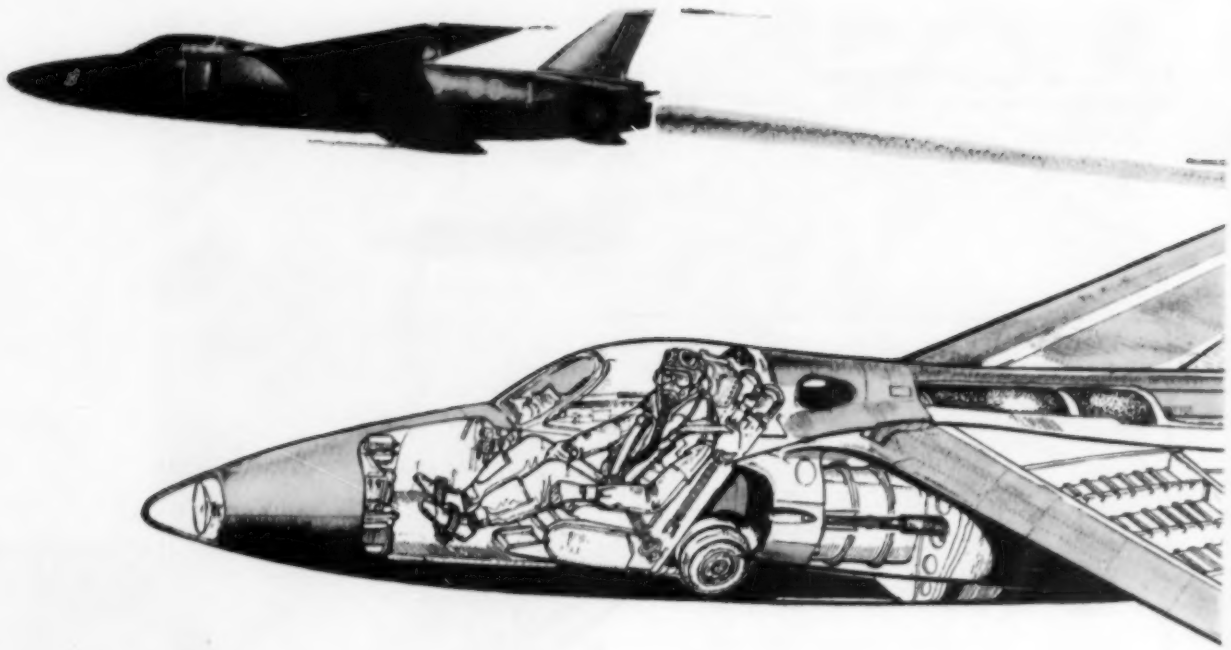
A PINT SIZE JET FIGHTER, reminiscent of Japanese interceptor philosophy, has made a definite impact on British thinking. The Folland *Midge*—span, 22 ft. 2 in., length 28 ft. 9 in., height 8 ft. 9 in. —has 40 degrees of sweepback.

Designed and built by a team under the guidance of W. E. W. Petter, (who designed the *Canberra* jet bomber, now built under license in the U. S.) the new aircraft is revolutionary in these days of heavy combat aircraft costing fabulous sums.

Simplicity and cheapness of the *Gnat* (service version of the *Midge* with more powerful engine), has been achieved through meticulous care in design, saving of structure weight, and use of the lightest engine available

The midget fighter can be transported on a truck without being dismantled and thus be ready to fly upon delivery.





Above: Cutaway of the *Gnat* (service version of the *Midge*) showing simplicity of design.

Excellent visibility, so important in combat, is afforded by extension forward of the main canopy and an optically flat panel mounted on the fuselage in front of the pilot.

The *Gnat* can be serviced without special trestles, etc., as it is no higher than shoulder height from the ground.

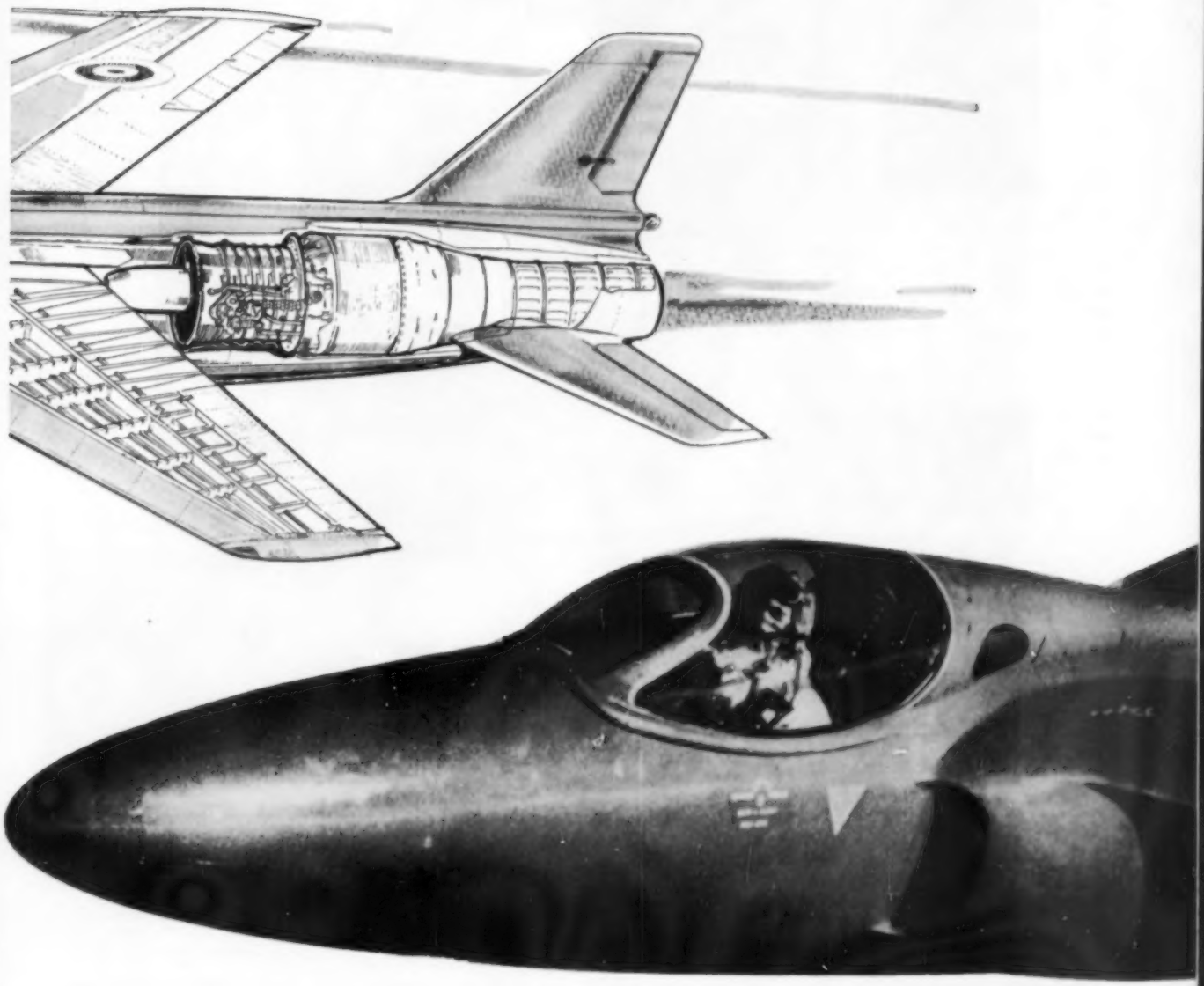
to give required performance. Equipment has been carefully screened and kept to a minimum. The weight is one-third that of a *Sabre*, F-86.

The *Gnat* wing is completely in one piece, extremely rigid, and fastened to the fuselage by four bolts. All fuel (enough for one hour cruise at altitude after climb) is carried in the fuselage below the wings and is pressure-fed to the engine positioned in the rear fuselage.

As in the trend of American design, the rear fuselage is removable, leaving the engine exposed for ease of maintenance.

The tailplane is of the "all flying type" found necessary in recent years with the advent of compressibility effect at high speeds. The aircraft is fitted with a tricycle gear, the main wheels retracting into the fuselage and the nose wheel into a compartment behind the pilot's seat. All are small and light due to the low weight of aircraft. Wing flaps normally used to cut down landing speed have been dispensed with and the main landing gear doors are used in their place, an effective and weight-saving arrangement due to low landing speeds.

Another unusual feature of the aircraft that has interested American engineers is the approach to the cockpit canopy design. The optically flat panel in front of the pilot is mounted on the fuselage and the usual heavy side windshield frame and plastic glass panels are dispensed with. The main canopy itself is extended forward to give a large unobstructed vision area, so important in combat. The canopy hinges behind the pilot's head and is jettison-



able in emergency. The plane is equipped with a lightened version of the Swedish SAAB ejection seat. All normal flight instruments are included. Other equipment includes radio, pressurization, supplemental oxygen, brake chute, gyro gunsight, etc.

The British state that the *Gnat* can be built for one-third the cost of a standard fighter and in approximately one-fifth of the production time. In addition, the aircraft's remarkably small size makes it an easily transportable weapon, without need for dismantling.

Performance of the prototype *Midge* and the production type *Gnat* is of course classified . . . probably the more so since foreign governments have shown an unusual interest in the plane. A fifty-hour service test has produced certain general information which may be cited. Where the *Midge* is high subsonic in straight and level flight, the *Gnat* is definitely supersonic under like conditions. Both models reach an altitude of plus 50,000 feet in a hurry and demonstrate a short turning radius.

Servicing of the *Gnat* without special trestles, ladders or platforms is sure to be a time-saving element of great significance in the interceptor business. END

FLYING's CHECK PILOT

CHECK PILOT REPORT ON THE

CESSNA 310

A professional test pilot evaluates Cessna's entry in the light-twin class of executive aircraft.

By FRED J. BUNYAN
Production Test Pilot, North American Aviation, Inc.

WHEN FLYING asked me to do a check-pilot evaluation of the new Twin Cessna 310, I contacted Foster Lane, Cessna distributor for Ohio, and learned he had just taken delivery of the sixteenth airplane to be produced. The numbers of these new light twins start with N2600. The ship I flew was N2616C.

The airplane has very clean lines. Wingtip tanks add beauty and are a big safety factor in storing gas far from the passenger compartment. In addition to this most important consideration, the tip-tanks undoubtedly add to the flight stability of the ship. This installation saved man hours in the fabrication and assembly of the airplane and makes fueling a simple function since the tanks can easily be serviced by a fuel attendant or mechanic standing on the ground.

The 310 is powered by two Continentals, each developing 240 hp at take-off. Each is equipped with a Hartzell controllable, constant-speed, metal, full-feathering propeller. The engines are flat and the nacelles have been streamlined for greatest efficiency. Two large stainless steel augmenter tubes on each engine nacelle provide cooling air which is pumped by the jet action of the exhaust into these tubes; likewise extra thrust is derived by the exhaust augmentation. This eliminates need for cowl flaps and the end result means more speed, and lower maintenance because of less moving parts. It furthermore does away with another "gadget" in the cockpit thus providing simpler operation.

Engine nacelles are chest high making it much easier for mechanics to perform their duties. I am sure they will be receptive to this.

As I continued walk-around inspection, I noted that the 310, in addition to obtaining lift from the wing area, derives also a certain amount of lift from the engine

nacelles and the tip tanks. Since the wings do not house the fuel cells, the landing gear is folded into them, permitting flat compact engine nacelles and thin wing design. The fully retractable landing gear is electrically operated and completely faired in by the landing gear doors. This fairing is similar to that used on most of our present day jet fighters.

The retractable step on the wing makes boarding the plane practically like walking up onto a porch; even the opposite sex will agree that the 310 is an easy airplane to enter. The cabin will accommodate five people, including the pilot. Individual front chair-type seats adjust fore and aft and are also adjustable through three reclining positions . . . a real contribution to comfort. The wide rear seat provides plenty of room for three people. It is possible for the pilot to enplane his passengers and then assume the left hand seat through the aisle. With this small aisle between the front seats, it is feasible to change from rear to front or vice versa while in flight.

The heating and ventilation system is adequate and the sealed flame internal combustion heater can be engaged without starting the engines. This assures a warm passenger compartment at any time desired. Cabin windows do not open, with exception of the small pilot's window in the corner of the left front window. The left rear window can be popped out as a unit when the emergency release is pulled.

The pilot's compartment is laid out in a very practical manner with engine control pedestal assembly conveniently located between the front seats, readily accessible to either pilot or co-pilot (dual wheel control is optional equipment). Throttles, propeller controls and mixtures all have different shaped knobs and are easily identified. In addition, the mixture control guides are serrated, making it difficult to bring the mixtures back to the idle cut-off position by mistake. Carburetor alternate air controls are provided; however, with the down-draft pressure type carburetors installed in this model it is only in extremely unusual conditions that carburetor ice might form.

Elevator, rudder and aileron trim-tab controls are mounted on the pedestal and readily accessible to the pilot. All tab control movements are natural and tab controls are marked distinctly. All switches, such as ignition, fuel boost, lights, etc., are mounted on the lower left side of the instrument panel within easy pilot reach. The flight instruments are mounted directly in front of the pilot on a shock mounted sub-panel. This is good grouping for instrument flight. Engine instruments, along with part of the radio gear, are on the right half of the instrument panel. All instruments have large size faces, easy to read at a glance.

The oil system is a wet sump type which utilizes the engine pans as oil tanks. The engine-driven oil pumps and oil coolers are mounted internally on the engines to eliminate external oil lines and hazards associated with leaky lines or fittings. Oil temperature is regulated automatically by thermostatically controlled coolers. Oil capacity is 12 quarts. The quantity can be checked easily by opening the access door on the left side of the engine nacelle (same for both engines) and reading the oil level on the dipstick located just aft of (*Continued on page* 48)

2

3

1

The author in the Cessna 310. Note the practically arranged panel and control pedestal.

4

2

Engines are mounted at a good working position from ground level

3

Refueling tip tanks is an easy task.

4

The Cessna 310 on the ramp at Lane Aviation, Ohio Cessna distributor.

ANTARCTICA AND U. S. COMPARATIVE SIZE

Above: Chart showing comparative size of Antarctica and the United States. Right: The author as he appeared with an Australian expedition to Antarctica.

An R4D uses jato assist for take-off from Navy carrier, *Philippine Sea* en route to Little America

Does the Antarctic hold

the key to long range forecasting?

POLE TO POLE

By ARTHUR SCHOLES, F. R. G. S.

Member of two Antarctic Expeditions.

THE STAGE IS BEING SET for the most daring and hazardous scientific mission of the 20th century . . . assault on the Antarctic, to wrest from that vast and forbidding icebox the secrets of its influence upon atmospheric conditions of the habitable world.

To herald the International Geophysical Year, 1957-58, six nations will have launched an offensive on the last vast unexplored area of the globe . . . the regions around the South Pole . . . where, in the six-months-long night, the rarefied air of the high polar plateau is believed to get colder than anywhere else on earth.

Those nations already under way or planning to take part in the campaign are, The United States, Britain, France, Argentina, Australia and Chile. New Zealand may come into the drive, Sir Edmund Hilary, conqueror of Mount Everest, is known to be anxious to participate.

The Soviet Union, too, is known to have sent whaling fleets to the Antarctic during the last five years, and to have set up at least temporary weather stations along remote coastal regions.

But regardless of all who take part, the effective knowledge to be gained at the South Pole in the interests of weather analysis will be far more difficult than have been the recent comparable efforts at the North Pole.

The South Pole lies 800 miles inland across limitless icefields and beyond a towering wall of incredible mountains and treacherous glaciers.

Since Amundsen and Scott, 43 years ago, no land-borne explorer has even visited the region of the South Pole. Now according to American plans, three scientists will live at the South Pole for an entire year, making weather reports, bouncing radar impulses off the ionosphere, and charting auroral displays.

Another forward base will be established in Marie Byrd Land at 80 degrees south latitude and 120 degrees west longitude. This is 350 miles inland and about 500 miles from the main expedition base at Little America in the Ross Sea.

But the establishment of a permanent weather station at the South Pole is not the most spectacular idea in the campaign of weather diagnosis. That place is reserved for the project of a straight line of upper-air observation stations extending from the U. S. Air Force's Arctic Ice Island, near the North Pole roughly along the 80th meridian clear to the South Pole!

This line of atmospheric soundings would take advantage of existing stations in Canada, the United States, the Caribbean, and the Pacific Coast countries of South America. Not all of these have upper air soundings at present but the project would add this type of observation to the ground observations now in vogue. Additionally, there are five British bases in the Falkland Islands which will tie into the pole-to-pole network.

From the Falklands, the line will continue to an outpost along the 80th meridian at the base of the Rockefeller Mountains and thence to the South Pole. The plan calls for an upper air observation each 24 hours. Thus, it is hoped to gain a continuous picture of high altitude north-south air circulation and its relationship to the science of more exact forecasting for the habitable parts of the earth.

The 80th meridian longitude has no special significance. It has been chosen only because it is the line along which most weather stations are placed.

Taken elsewhere, the Pole-to-Pole soundings would have to leap the great gap of the Antarctic Ocean, known as the roughest sea in the world to those who have crossed its frontier. Because of the great (*Continued on page 78*)

Above: Auster seaplane lashed to launching platform on stern deck of the *Kista Dan* on recent expedition to Antarctica. Right: United States Navy icebreaker, USS *Atka*, in Antarctic waters.

PERILS OF

All problems related to the speed of sound disappear in outer space where only an unbreakable silence exists.

By WALTER R. STEWART

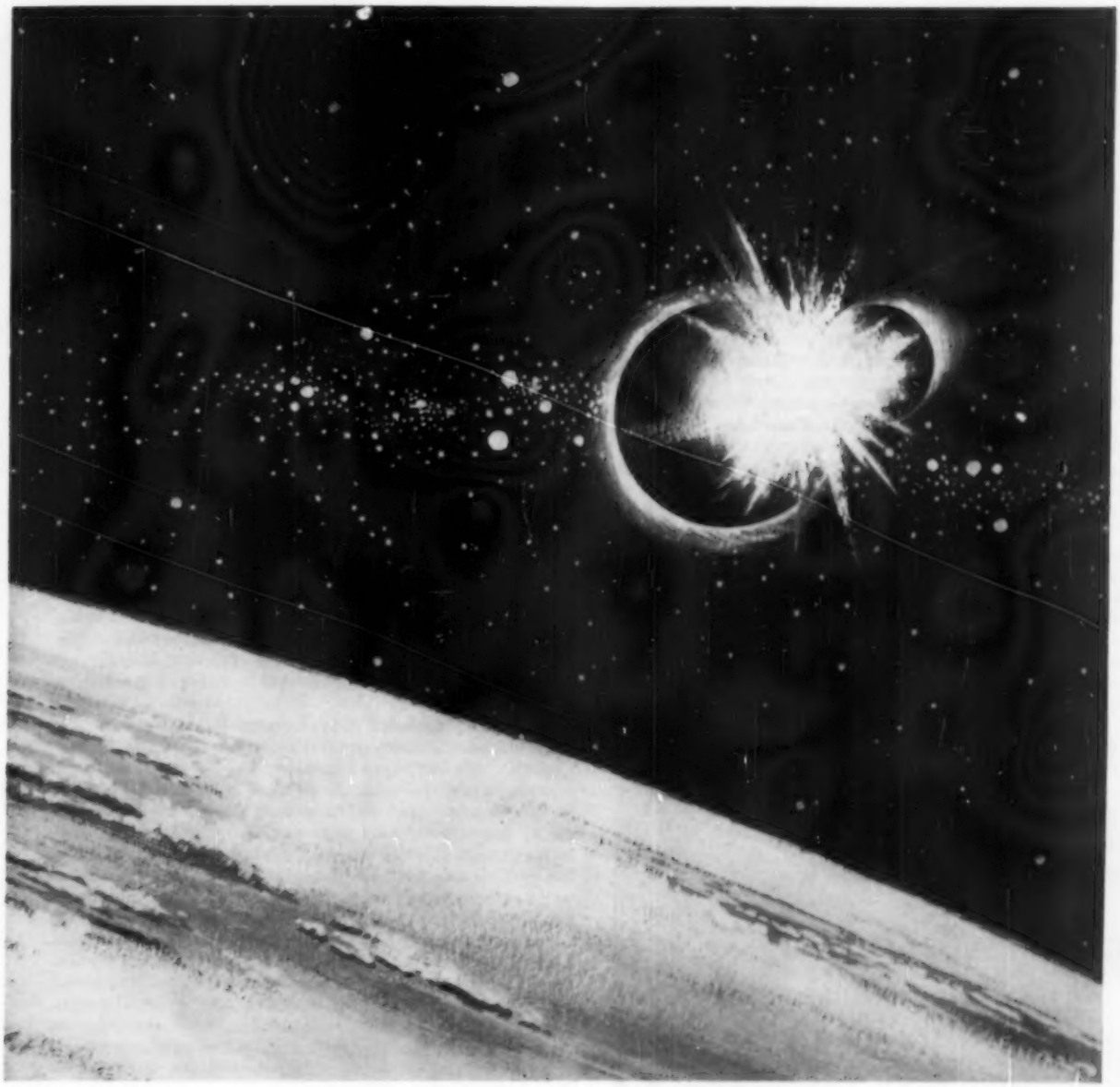
ILLUSTRATION BY ED VALIGURSKY

IMAGINE YOURSELF suspended 120 miles above the earth where you could witness the titanic collision of two other planets. You would no doubt see clearly and probably react emotionally to the awesome spectacle, but you would not hear *even a whisper!*

Out there in space at the 120-mile level, the air is so rarified that it can't even support a sound wave! This level has been named the *acoustical border* by Dr. Hubertus Strughold, head of the Department of Space Medicine, U. S. Air Force School of Aviation Medicine.

The reader may ask, "What's the use of research for space travel?"

First of all, space flight is not subject to adverse weather



SPACE FLIGHT

conditions such as fog, clouds, electrical storms, and turbulence.

Second, space flying is important strategically. Such flights are protected against enemy action simply by the height and speed of the craft.

Third, we can better understand the characteristics of flight inside the atmosphere by studying the contrast with flight in space.

And, too, space flight presents a unique opportunity to study the earth as a global whole, as well as telescopic study of other planets, without the disturbance of light absorption and air turbulence.

Finally, comparative studies of other planets will enable us to better understand our own atmosphere and particular position in the solar system.

Reporting recently on a current picture of space medicine, Dr. Strughold began by drawing a line of distinction between the popular term *space travel* and the more meaningful term *space flight*. Space travel carries with it the implication of going a great distance in order to achieve a remote and unfamiliar place (for example, the moon); space flight, on the other hand, is more concerned with flying from one place to another on the earth, but passing enroute through altitudes having the same characteristics as outer space. If the problems of *space flight* can be solved, Dr. Strughold is of the opinion that *space*

travel will develop quite naturally. Speaking frankly, the doctor stated, "Space flight, for the last few years, has been an accomplished fact; indeed, we are now in the middle of its development!"

The staggering challenge presented by space flight may be summed up by noting, briefly, the principal differences between space and the atmosphere in which we live.

The atmosphere contains a high concentration of oxygen; in space there is no oxygen.

The atmosphere exerts a pressure on all of us and this pressure keeps our body fluids in a liquid state; in space there is no pressure and body fluids boil away. Up to a certain altitude, atmospheric pressure may be used to pressurize aircraft; in space there is no free air which may be compressed for this purpose.

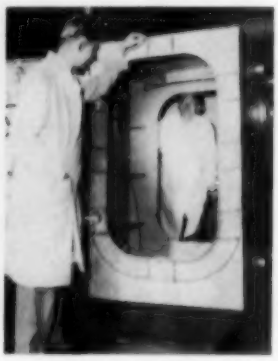
In the lower zones of the atmosphere we are protected from intense solar and cosmic radiation through filtering by the air; in space no such protection can be expected. In addition, the atmosphere protects us from meteorites; in space this protection is lost. Air molecules in the atmosphere, too, scatter light rays and produce our diffuse blue daylight; but in space we find a permanent and mysterious state of darkness.

The atmosphere provides support and lift for aircraft; in space the near-vacuum condition offers no support whatever—a factor which leads to the alarming *gravity free* situation!

In the atmosphere we find friction resulting from the collision of air molecules and high-speed aircraft; in space we encounter a completely frictionless condition.

Just where does the atmosphere end and space begin?

Theoretically the atmosphere extends out about 600 miles: this is the limit recognized by astronomers and



Scientists examine new sealed cabins for space medicine experimentation at the U. S. Air Force School of Aviation Medicine, Randolph AFB.

physicists. But for *space pilots* this information is almost useless. Dr. Strughold insists that the actual material limit of the atmosphere is not important to us. What is vitally important, is the different *functions* of the atmosphere. These functions are many and, as we climb toward outer space, we find them disappearing one or two at a time. At levels where these disappearances take place, we find an alarming situation: *actual space conditions* take over and replace the disappearing atmospheric function.

Let's climb into an imaginary space ship and take a closer look at these incredible levels.

We know that Man needs oxygen to live and, up to an altitude of 10,000 feet, there is sufficient oxygen present to sustain him. Between 10,000 and 21,000 feet, the oxygen supply decreases to critical levels. At 50,000 feet the oxygen function of the atmosphere drops to zero. Suddenly exposed to this condition, we would depend exclusively on the small oxygen reserve of our bodies—about one liter—which would allow us about 15 seconds to act. We can conclude that above 50,000 feet, as far as oxygen is concerned, we have the same condition that we will find in outer space. The *space-equivalent* for oxygen, then, is 50,000 feet.

Just a little higher at 63,000 feet, we find another space-equivalent. At this altitude our body fluids would begin to boil. This reaction occurs because of the drop in air pressure. Now, as far as our body fluids are concerned, we are already in outer space!

The pressurized cabin developed in the mid-thirties is a protective device designed to counter the effects of severe drops in air pressure and oxygen content. But this type of cabin derives its possibility from the outside free air. At about 80,000 feet, this pressurized cabin system is useless for three reasons. To begin with, at this altitude, air density is about 1/25th that of sea levels; tapping this free air would require compressors which are too heavy and large for our space ship. Even if we were able to compress what free air is available, the resulting heat from compressing it would make our cabin air soar to unbearable temperatures. The zone between 90,000 and 140,000 feet is enriched with ozone, a peculiar form of oxygen; compressed to normal air pressure, this ozone might have serious irritating effects on our lungs.

For these reasons, space scientists such as Dr. Strughold must discard the principle of the pressurized cabin in favor of an entirely new principle—the *sealed cabin*. In such a cabin we would find a closed, self-sufficient system in which we will take with us things necessary to sustain life.

Here is our problem. Oxygen must be replaced as it is used; carbon dioxide, water vapor, methane, and hydrogen sulphide (all produced by our bodies) must be removed from the cabin air. All of this must take place in our hermetically sealed cabin! Currently, it is proposed that a little over four pounds of seaweed (algae) in a nutrient solution would absorb enough carbon dioxide and release sufficient oxygen to keep one man alive in a sealed compartment. If such an arrangement proves practical, the theoretical limits of our sealed cabin extend to infinity and we have a green light into outer space.

Cosmic rays pose a different kind of problem for us. In the lower layers of the atmosphere, we are protected against them by the filter-function of the air. In very high altitudes, we must reckon with these radiations in their original form and intensity. When primary cosmic rays enter the atmosphere between 60,000 and 120,000 feet, ionizations and nuclear explosions occur. In this zone the primary rays lose much of their original power. The fragments produced at these high levels rain down in showers through the lower layers of the atmosphere. These *secondary* cosmic rays have less punch than their primary parents, but they are powerful enough to penetrate several hundred feet of water! So, up to 60,000 feet, we are exposed to cosmic secondaries; above that altitude—up to 120,000 feet—we will be subjected to primary cosmic bombardment. Hence, we have arrived at the cosmic radiation space-equivalent zone. Let's go higher!

Of lesser importance is the sunburn produced by ultraviolet light from the sun. The space ship's hull will absorb this for us and we shall be protected sufficiently to continue our trip. Ultra-violent light exposure is at full force in levels exceeding 140,000 feet—another space—equivalent.

At about 400,000 feet, we encounter the twilight of space. Here the molecules of air are so scattered that we no longer find the diffuse blue (*Continued on page* 71)

A tortuous trail from the big city across the desert to the flight line proved to be the

FIRST CROSS-COUNTRY OF THE A3D

By EDWARD A. HERRON

NO STRANGER JOURNEY has ever been taken by an aircraft than that of the A3D from the Douglas Plant in El Segundo, Calif., 171 miles to Edwards Air Force Base at Muroc, in the desert.

The plane crept across the entire width of the third largest city in the United States, wings stretching from curb to curb. It caused telephone poles, electric light poles, traffic signals, railway gates and an assortment of shade trees to be uprooted; then carefully restored.

At five miles-an-hour, the A3D inched over Ridge Route Highway, the most stupendous hulk ever seen on that highly important thoroughfare. Draped and shrouded in a gigantic nightgown, the plane inched through the mountain passes, out into the desert and through the entanglements surrounding the military base at Muroc.

New aircraft being transported on lowbeds are not a rarity in Southern California. The vast majority of them are sleek, slim jet fighters which fit nicely into the flow of automobile traffic with one or two motorcycle policemen for escorts.

The plane the Belyea Truck Company transported was a monster, the most powerful airplane ever designed for Navy carriers and the Navy's first sweptwing jet attack plane. The aircraft, complete to the last wingnut, was the widest piece of equipment ever to travel any distance on California highways.

Navy was not being capricious in ordering the plane inched out to Muroc. The runways adjacent to Douglas' El Segundo Plant are adequate for proven aircraft, but no chances are taken with untried wonder birds like the A3D. Out in the desert calm of Muroc are 40,000 feet of runways where a question mark can be test hopped to a fare-thee-well. Muroc's expanse of blue sky is utterly unchallenged by any civilian aircraft. And it has an unpopulated desert where emergency landing can be made with the greatest degree of safety for all concerned.

Difficulties encountered in that vast road block of 171 miles were staggering.

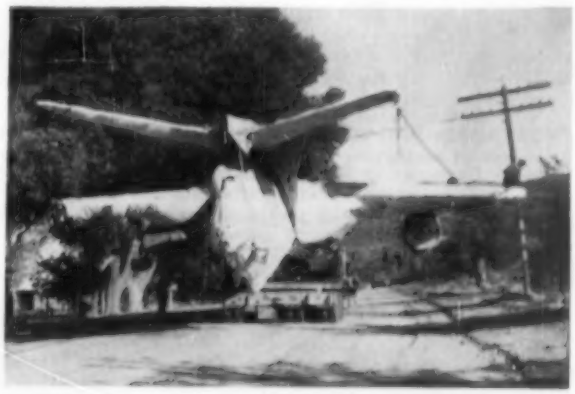
To begin with, a foreman and his helper with a steel tape started out in a light pick-up truck. They made their first measurements at the fences surrounding the Douglas Plant. At the end of four days, they dragged their tape across the dust of the roadside leading into Edwards Air Force Base.

A direct run between the two points would cover 110 miles. Bending and twisting to avoid obstacles that could not be moved, the two men traced a route of 171 miles.

For step two, the foreman went out again, this time accompanied by an engineer. They double-checked the proposed route.

Still a fourth trip was necessary to spot turnout sites approximately every 15 minutes along the highway that traversed the heavily traveled Ridge Route. Because the plane would block the northbound road from side to side, with no alternative detours, it was necessary that plans be made to haul the monster off the roadway at regular intervals, to unplug the glut of automobiles piling behind the procession. Minimum northbound traffic on the Ridge Route is 235 cars per hour.

The date for the start of the job was selected. Weather Bureau officials were consulted. (*Continued on page* 74)



Right: Shrouded bomber's wingspan presents problem
Below: Ten-wheel tractor tows A3D over city streets

The author in the roomy 1-26. Note radio equipment behind the seat.

HIGH-PERFORMANCE SAILPLANE KIT

This new American-built glider is both comfortable and efficient.

By PETER M. BOWERS

FOREWORD: *Peter M. Bowers, flight test engineer for Boeing and regular contributor to* FLYING, *has been Pacific Northwest Soaring Champion for the past two years. Having replaced his German Goppingen* Wolf *sailplane with a Schweizer 1-26 kit, and having flown the kit prototype extensively, he has the authentic experience to write of this new development.*

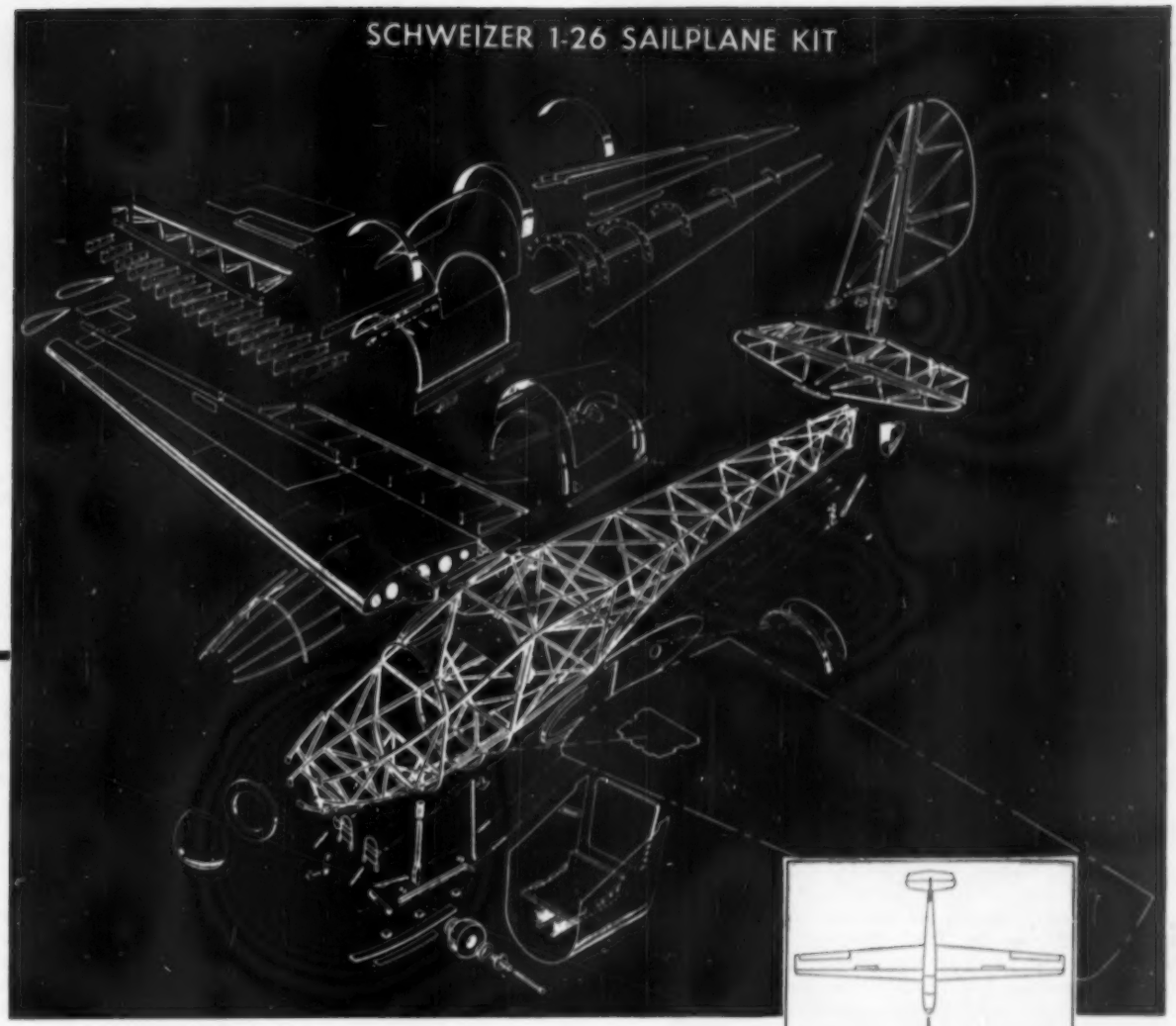
GLIDER PILOTS LOOKING for a modern, low-cost high-performance sailplane, finally have cause for rejoicing. Schweizer Aircraft Company, Elmira, N. Y., has engineered a kit for an all-metal, single seater which can be assembled at home with a minimum of special tools.

Prototype, 1-26, the "1" signifying single-seater and the "26" standing for Schweizer's 26th glider design, was first flown in January '54, being designed originally with kit production in mind. The company was already in production on three basic types, the 1-19 utility single-seater, the 2-22 two-seat trainer, and the high performance 1-23D. The 1-26 is a medium-high performance craft outperforming war-surplus two-seaters which have formed the backbone of American soaring and still is structurally simple enough to keep costs low.

Depending upon various optional details available to purchasers the 1-26 kit ranges in price between $1,375 and $1,495. The sailplane fully constructed by Schweizer markets around $2,500. In general, a kit purchaser saves himself about $1,000 by doing his own final assembly.

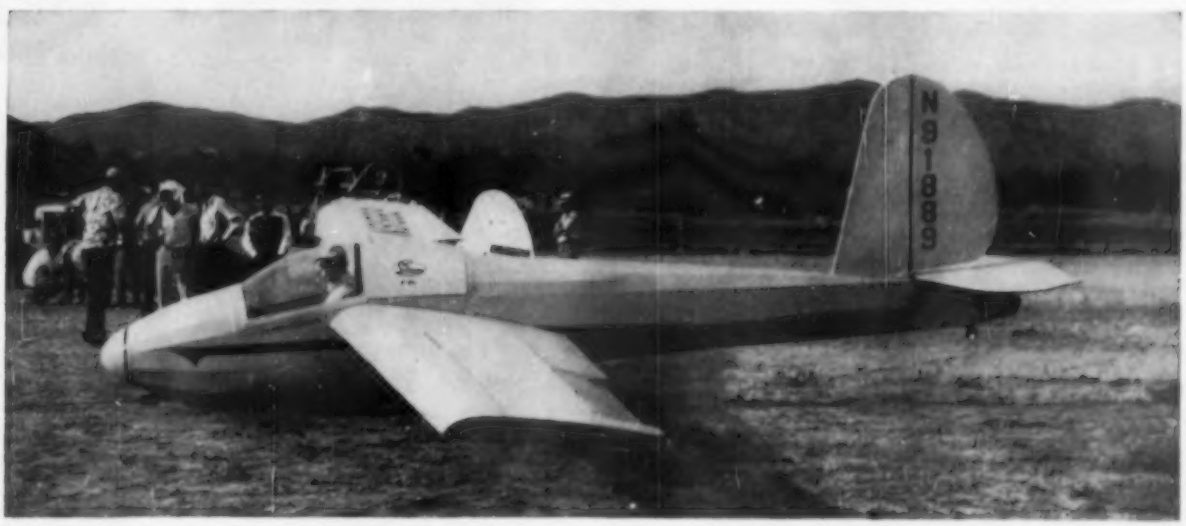
When the 1-26 prototype was flown, it proved to have expected performance but before proceeding with production kits, Schweizer sent questionnaires to the soaring pilots of the country to obtain market reaction. The company announced that kit prices would be determined by results of the survey; and that production would not be undertaken unless 50 firm orders, with deposits, were received. As it turned out, 40 orders were received by the time the second prototype had been completed and given its Approved Type Certificate by CAA. Decision was made to go ahead on kit production.

The 1-26 is a conservative design of composite metal construction, the fuselage being built up of welded steel tubing while the wings and tail are riveted aluminum assemblies. The ship is fairly small when compared to most American sailplanes, having a wing span of only 40 feet; and the weight is comparatively low, considering the metal construction. Empty weight is 348 pounds and maximum gross is 575, which means that even a 200-pound pilot has 25 pounds available for equipment. As a result of the past year's testing of the prototype by almost a hundred of the country's top (*Continued on page* 65)



Exploded view and (inset) plans of the Schweizer 1-26 sailplane.

The author about to demonstrate the 1-26 at the 21st National Soaring Championships.



SHARPSHOOTING GUARD

How the 140th Wing, flying obsolete equipment, won the annual fighter-gunnery meet.

By ED MACK MILLER

I'VE BEEN THROUGH a couple of combat tours in two wars, been shot down once, married once, had two kids, and never had it so rough."

That's how Lt. Col. Walt Williams described the annual Air National Guard Fighter-Gunnery meet at Boise, Idaho, last October.

Sharpshooting Williams and his right bower, Capt. Bob Sands, however, didn't "go apesweat" when the chips were down. Their Wing, the 140th (Colorado, New Mexico, and Wyoming, with Williams commanding the 120th Fighter-Bomber Squadron in Denver, and Sands as "ops" of the 188th in Albuquerque), swept the competition in the All-Air Guard meet.

They also won the right to try a hatchet job on the regulars when they tangle in September at the annual Air Force Fighter meet at Las Vegas.

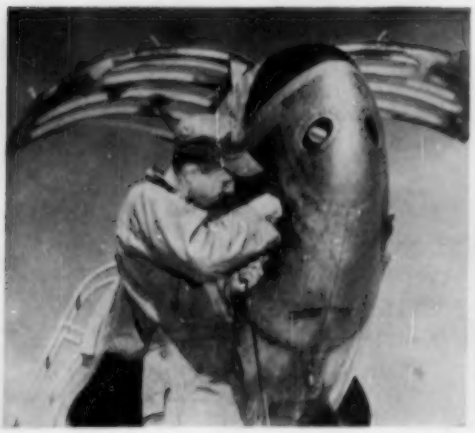
Few people around the Air Force are selling the weekend warriors short after what the Rocky Mountain blowtorch boys did at Boise. When that brouhaha was over, people were "shook" all the way from the Pentagon to the Pacific, for the 140th, flying F-80's, an obsolescent airplane and gunsight, had clipped the swept wings of a dozen *Sabrejet*, radar-sight-equipped Guard units.

Part of the reason for the astounding victory was the leadership of "Boss man," 43-year-old Brig. Gen. Joe Moffitt, a "real tiger" who, although a grandfather, flies regularly with his boys. Victory is not unusual for "General Joe." Two years ago at Clovis, N. M., his fighter boys whipped the Ninth Air Force at gunnery.

Moffitt's right-hand man, Williams, is, like Joe, a leader who leads. Veteran of both World War II and Korea, Williams is hot at acrobatics and gunnery. He won team-victory and second high individual honors at Boise and came back to Denver to fly his acro-team, "The Minutemen," through maneuvers that made Denver forget other flight demonstration teams. An "always-thinking" sort of guy, Williams just plain "reasoned" his team to victory in Boise—and he hopes to use the same technique in September. If the 140th should top the Air Force, someone will have to take a new look at the Air Guard, which regularly trains about one-fifth of what the regular establishment does.

The upset in Idaho was not, however, accomplished without a lot of "sweat"—and neither will an upset in Las Vegas be pure luck. Granted that Williams and Sands are "hot" gunners, an extra plus of foresight and teamwork was what won for the 140th. For instance, Williams and Sands had their gunsights (*Continued on page 58*)

Below: ANG crew chief readies an F-80 of the 140th Wing



Brig. Gen. Joseph C. Moffitt, Commander of the 140th Fighter-Bomber Wing.

Lt. Col. Walt Williams, Commander of the 120th Fighter-Bomber Squadron in Denver, flying a Colorado ANG F-80.

Right: Capt. Mel Conine (left), Capt. Bob Sands (center) and Lt. Col. Williams inspect the target.

Below: The triumphant team of the ANG 140th Fighter-Bomber Wing (Colorado, New Mexico, Wyoming) happily holding trophies mounted with miniature Sabres. The 140th used obsolete F-80's to win the meet.

Tape a thermometer on your wing strut and utilize one of the most economical flight safety aids found on the market.

MY FRIEND THE THERMOMETER

A lot of sound reasoning can be interpreted by this neglected "Basic Instrument."

By TED DUROSKO

FOR TWO DOLLARS, you can purchase a reliable flight safety aid. This device, with proper interpreting, will help you reach sound decisions both on the ground and in the air. It will indicate whether it is safe to take off; whether the flight should be discontinued; remind of conditions which present carburetor icing; and supply the basic factor needed to correct altimeter and airspeed readings.

An ordinary outside thermometer with large print, taped to a wing strut where it can be read from inside the cabin will report the "outside" or "free air" temperature; and this information is the key to a number of deductions.

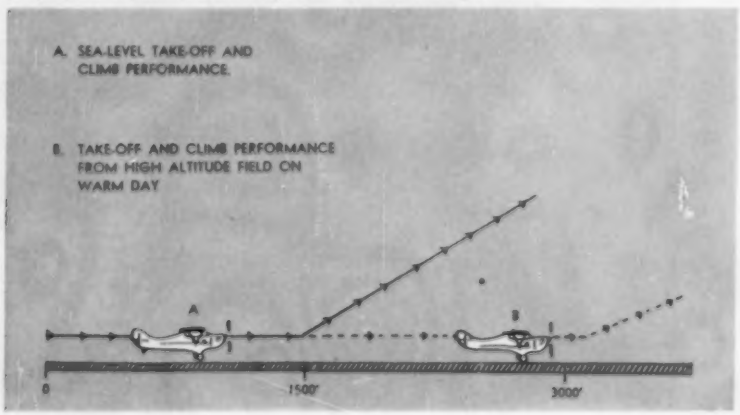
Take, for example, the case in which a pilot landed a *Pacer* on a mountainside strip in central Colorado. He had no difficulty landing with two passengers and hunting equipment, but was concerned about the take-off to be made two days later. Though the strip was 3,500 feet of turf and blocked at each end with relatively short trees (15 to 20 feet high), the elevation was 5,500 feet. Also, the temperature during the day often peaked to 80 and 90 degrees F.

Realizing that elevation and air temperature are two

THE PRO'S NEST

FIG. 1

Temperature and altitude effect upon take-off and climb performance.



important factors effecting take-off performance, (Fig. 1) the pilot recorded the temperature every four hours during the ensuing time. Once having the range of temperatures, he flipped over his sectional chart and applied the information to "The Koch Chart for Altitude and Temperature Effects," usually found on the reverse side.

Upon determining the percentage of difference in performance, the pilot figured actual take-off runs and rate of climbs. Fortunately, in planning for this trip, he had felt out the *Pacer* at his home port at Cleveland, Ohio, and knew that, at an elevation of 572 feet, it took 1,500 feet of take-off space to clear a 50-foot obstacle. Its climb during the first minute was 820 fpm. This was with the same load the Piper *Pacer* was carrying on the trip. And being on the conservative side, the pilot used these figures for the *Pacer's* normal sea level performance.

Here is what he found regarding how temperature would effect the take-off at the mountainside hunting site:

8 a. m.: Temperature 70 degrees F. No go. The *Pacer* would need 3,300 feet of runway and would have a climb of only 212 fpm. Too close a squeek on an unkept turf runway.

12 noon: Temperature 82 degrees F. Take-off run 3,750 feet; climb 287 fpm—suicide on a 3,500-foot strip!

4 p. m.: Temperature 70 degrees F. Statistics same as for 8 a. m.

8 p. m.: Temperature 55 degrees F. Take-off run 3,000 feet; climb would be 369 fpm. Possibility, but would be flying mountain area in diminishing light.

12 midnight: Temperature 50 degrees F. Runway needed would be 2,850 feet, climb would be 385 fpm. Positive take-off, good climb, but it is dangerous to fly mountains at night in single engine craft.

4 a. m.: Temperature 38 degrees F. Take-off run 2,700 feet; climb 445 fpm. Positive take-off, good climb, would be flying into increasing light.

From the foregoing figures, the pilot chose a daybreak take-off time. He knew that he could expect the *Pacer* to break ground about three-quarters down the runway and that it would have climb enough to safely clear the trees at the end of the strip. With such planning, a safe take-off was executed and the pilot was spared mental wear and tear as the *Pacer* ate up the distance before becoming airborne.

Likewise in the air, the temperature gauge is a useful instrument, especially while flying in turbulence when decision must be made whether it is safe to continue or wiser to land.

To interpret this information from the thermometer, it is first necessary to understand the factor of "lapse rate." This technical term means that, as a general rule, temperature decreases with altitude until a sufficiently high level—the tropopause point—is reached. However, the tropopause point is well beyond the service ceiling of personal aircraft and we need not consider temperature complexities above that point.

The normal lapse rate is 3.5 degrees F. per thousand feet of altitude. This value was determined by the Weather Bureau after averaging thousands of observations over the surface of the earth for a period of time.

When we have a significant deviation from this normal lapse rate, the change is the key to weather forecasting.

By measuring the temperatures at several levels above the surface and comparing the temperature decreases with the various "code rates," we can determine whether the air will be stable, or in equilibrium (can change either way), or unstable with vertical currents—turbulence.

What are the code rates of temperatures? It works like this:

If the change of temperature per thousand feet is less than 5.5 degrees F., vertical current action is restricted and the air is likely to be stable. A change of the normal lapse rate of 3.5 degrees F. per thousand feet indicates stable air, and a change of only 2 degrees F. indicates that vertical currents are strongly resisted.

A change of exactly 5.5 degrees F. indicates the air in equilibrium. Conditions neither offer resistance nor favor vertical currents. This condition should be watched closely.

On the other hand when the change is greater than 5.5 degrees F., for example 6 or 7 degrees, vertical currents are favored and will increase in velocity as they go upward and downward. Such vertical action creates a rough ride for aircraft flying through. Turbulence causes the aircraft to roll and buck with short and quick upward, downward and sideward movement that requires corrections. At times these correc- (*Continued on page 69*)

FIG. 2

Airspeed error due to variation from standard sea-level pressure and temperature.

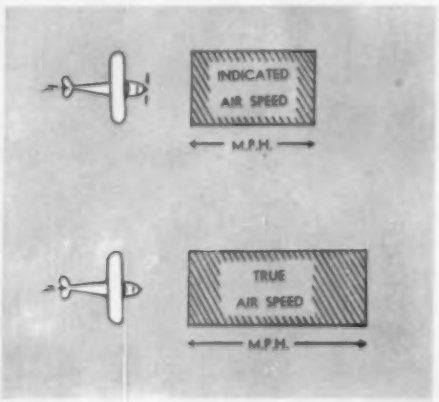
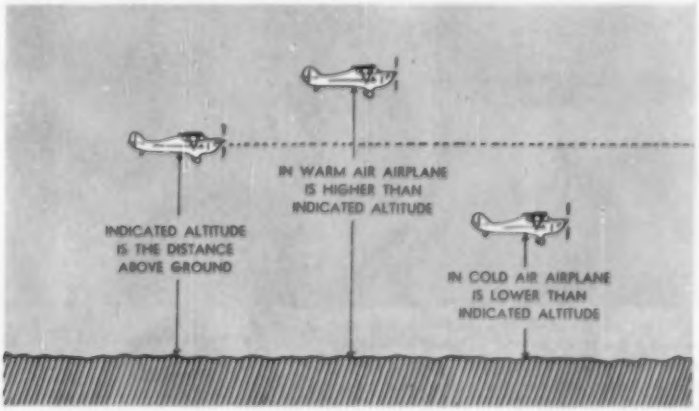


FIG. 3

Altimeter error due to temperature variation.



1. Balloon is prepared for inflation. Laid out carefully on ground, with net in place, sand bags are hooked to net. ▶

The FINE OLD ART of FREE BALLOONING

▲ 9. Balloon has just been released and begins ascent. Some sand bags have been released to stimulate rate of climb to get over obstructions at end of the field.

7. Removing sand bags from net lines to be hung on basket, where they are carried in flight. ▼

▲ 8. Balloon is "weighed off" for flight. This operation consists of careful removal of weight (sand bags) until balloon is capable of lifting crew in basket and the remaining sand bags.

2. Through tube, upper left, inflation is begun. Helium is fed into bag through balloon's appendix, or tubular opening at bottom of bag.

3. As gas forces balloon up, sand bags are hooked to lower position on net. This permits balloon to expand but prevents it from rising.

4. Balloon about one-half inflated. Sand bags are constantly hooked lower on net as more gas is admitted to bag.

WHENEVER GOODYEAR, maker of blimps and airships for the Navy, has need of additional test pilots for its lighter-than-air program, it revives the fine old art of free ballooning.

Commercial airship pilot licenses are not easily come by, and before the students can fly powered lighter-than-air craft, they must qualify in free ballooning. Then, for a period of a few weeks, the colorful, spherical "free" balloon—man's first successful vehicle for air navigation—again becomes a familiar sight to Ohioans in the vicinity of Goodyear's base at Akron.

Out of a group of 23 students, selected from among 75 applicants, 12 usually are expected to complete the course and qualify for commercial airship pilot's wings. Reduction to this number is by com- (*Continued on page* 63)

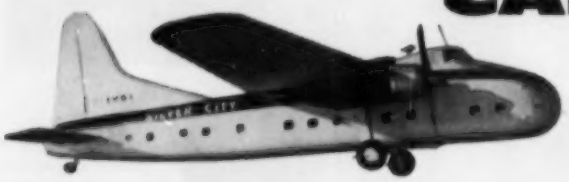
By T. H. ALLISON

5. Balloon is ready to have basket attached. Note appendix and arrangement of sand bags holding balloon.

6. Load ring and basket showing lines that extend from bottom of net. Loops in the ends of the lines are fitted over toggles on load ring.

Above: New Silver City Terminal at Ferryfield.
Below: Bristol *Superfreighter* with an adjustable bulkhead used in service across Channel.

CARS TAKE THE



THE BRISTOL 170 *FREIGHTER* stood waiting, its nose doors open, at Lympne on the south coast of England. A motorized ramp chugged into place and two cars were driven up the ramp and into the front of the airplane. As the wheels of the cars were chained to the floor of the aircraft and the nose doors closed, the passengers, seven of us, entered the separate passenger compartment in the rear of the plane.

It was all very simple and uncomplicated—a routine flight by Silver City Airways, the flying car ferry service which transports 25 per cent of all vehicles taken across the English Channel.

Drivers of the cars carried on our trip had arrived at the airport only 35 minutes before take-off time. Met by uniformed representatives of the Automobile Association and the Royal Automobile Club, who were on hand to assist members with the necessary carnet for export, the car owners had quickly handled the necessary paper work and had time for refreshments at the terminal before clearing Customs and boarding the plane.

As we settled comfortably in the cabin, the plane took off for France. Whitecaps below indicated that the sea crossing would have been a rough one that day. The man beside me had previously sent his car by ship. "But never again," was his comment. A time comparison shows why. Ship crossing from Southampton to Le Havre takes 6 hours 45 minutes and cars must be at the dock 2 hours 15 minutes before sailing time. Silver City flies a car to Cherbourg from Southampton in 35 minutes and cars need to be at the airport only 35 minutes before take-off. This make 9 hours by ship against 1:10 by plane, not including the difference in time for unloading and clearing Customs. Customs and immigration had taken less than 10 minutes at Lympne before our flight.

Fifteen minutes after take-off, the flight attendant opened the door from the car compartment with a "fasten seat belts" request. We were soon making a straight-in approach over the orange-tiled roofs outside Le Touquet Airport. Exactly 20 minutes from take-off, the wheels of the Bristol touched French soil. Practiced hands unchained the car wheels, a ramp was moved up to the plane and the cars were driven out. Less than 10 minutes was required for Customs inspection and the trip was over—the shortest, cheapest air route from England to France and the most convenient way to get a car across the English Channel.

You can send a bicycle by air across the Channel for as low as 63c and accompany it yourself for $6.24 on mid-week fares, spending barely more time than it takes to cross the Hudson River River by ferry. A small *Austin*

Left: Cars are driven aboard through the nose of the ferry plane while passengers embark at rear door. Below: Cars and motorcycles waiting on the ramp to board the air freighter with their owners.

Below: Youthful cyclists take advantage of speedy and inexpensive air route across the English Channel.

You can take an air ferry across the English Channel with your car or bicycle in a matter of minutes.

By ALICE S. FUCHS

SKY ROAD

might cost you slightly over $17, while a large American car might go for approximately $48, depending on the rate of exchange. You do not need the excuse of an accompanying vehicle to fly across yourself, as individual passage is available on Silver City planes.

The route we followed from Lympne to Le Touquet, France, was that flown by the first Silver City car ferry six years before. In 1948, 170 vehicles were flown across the Channel. Today Silver City is carrying over 30,000 vehicles a year, in addition to 100,000 passengers, and the figures are still skyrocketing. In August alone of 1953 the airline carried more vehicles than in the whole previous year. Week-ends, the busiest times, find Silver City freighters crossing the Channel up to 170 times a day, and on one Saturday last August, a Silver City aircraft was either taking off or landing every 2 minutes 18 seconds from dawn to dusk. Usual time on the ground for unloading one flight and loading another is 25 minutes but it has been done in 4 minutes.

So popular is the air ferry service that the company, following numerous requests, now sells a metal car badge to be placed on the vehicle as a permanent souvenir of the cross-Channel trip.

Along with volume progress made by Silver City in seven years has come a spectacular decrease in rates. In 1948 the round-trip fare for a Morris *Minor* with two passengers without insurance was slightly over $150. This year's rate is $60, insurance included, less than half the fare of seven years ago.

In choosing the Bristol *Freighter* as the most satisfactory plane for car ferry work, Silver City adopted an airplane well suited to carry both vehicles and passengers. A modification made by the Bristol company enlarged the nose on later (*Superfreighter*) planes and added an area at the base of the vertical fin for aerodynamic compensation. The planes normally cross the Channel at 1,000 to 1,500 feet at 165 mph.

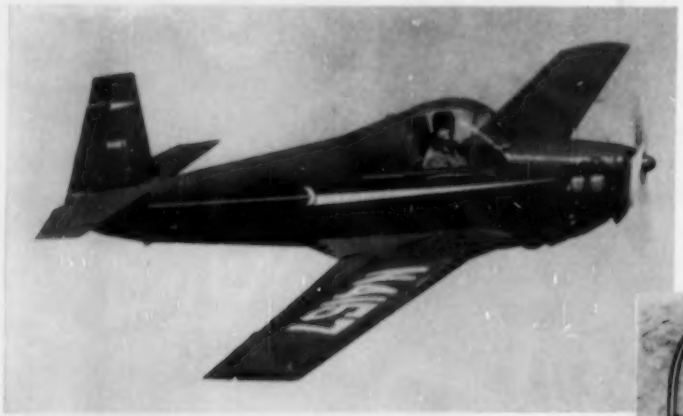
The Bristol holds three cars, which are loaded through the nose of the plane. Since no special preparation on a car is needed for air ferry, baggage may be left in the car and up to three-quarters gasoline capacity may be carried. There is a 6 ft. 6 in. (from the ground) limitation on radio aerials or baggage loaded on the roof. Car wheels are chained to the floor of the aircraft, while motorcycles and bicycles are held in an upright position with protective webbing.

One of the most convenient features of the service is the fact that the driver of the car and his passengers can travel in the same aircraft as the vehicle. Seats are comfortable and there is adequate window space. The *Superfreighters* have an adjustable bulkhead which can adapt the cabin for 12 to 20 passengers, allowing more or less vehicle space as the loading demands.

Five cross-Channel routes, (*Continued on page* 77)

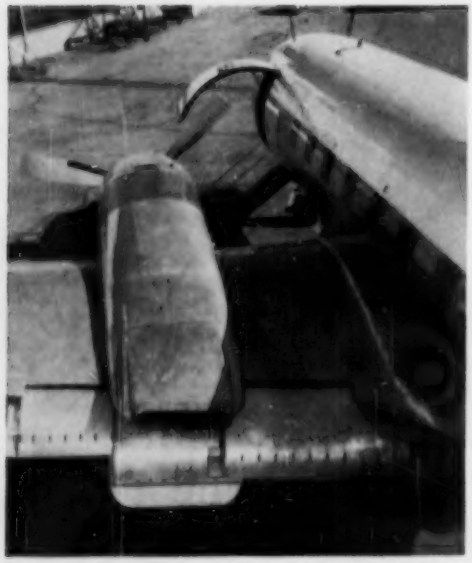
SEA-GOING T2V-1

Right: First jet trainer designed to operate with U.S. Navy aircraft carriers, the New Lockheed T2V-1 schoolplane (foreground) flies its student-instructor crew at a 600 mph clip and performs all maneuvers of a standard Navy fighter. Novel feature is its boundary layer control system wherein compressed air from the engine is ducted into the wing and squirted through tiny holes directed at flaps and ailerons; this causes the normal airflow to hug the control surfaces and give the plane greater lift and anti-stall characteristics.



1955 MITE

Left: This year's Mooney *Mite* has had its face lifted. Biggest feature of the current model is a more comfortable cabin with plenty of leg space and head clearance; all-new seat adjustable fore and aft and cushioned with No-Sag springs and foam rubber. Windshield and hatch canopy are larger and thicker. Instrument panel is much larger (see below). Landing gear retraction lever has been relocated 20 inches rearward. Soundproofing and thermal insulation has been improved. List price with standard equipment is $3,695 FAF, Kerrville, Tex.

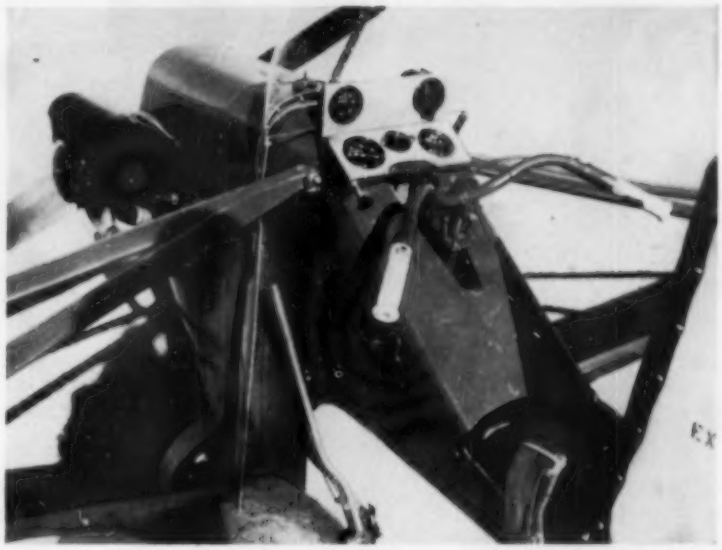


MUFFLED 340

Above: Rectangular exhaust opening, replacing two circular jet augmenter tubes, is a major feature in a series of improvements to make the Convair-Liner quieter. Others include special inner windows and application of acoustical tape to some interior surfaces.

HELIVECTOR

Above: The manufacturer of this unusual craft, Aero Affiliates of Ft. Worth, Tex., claims any man can fly it. Capable of speeds up to 90 mph and altitude of 10,000 feet, Navy is interested in it as replacement for LSM's and landing barges.



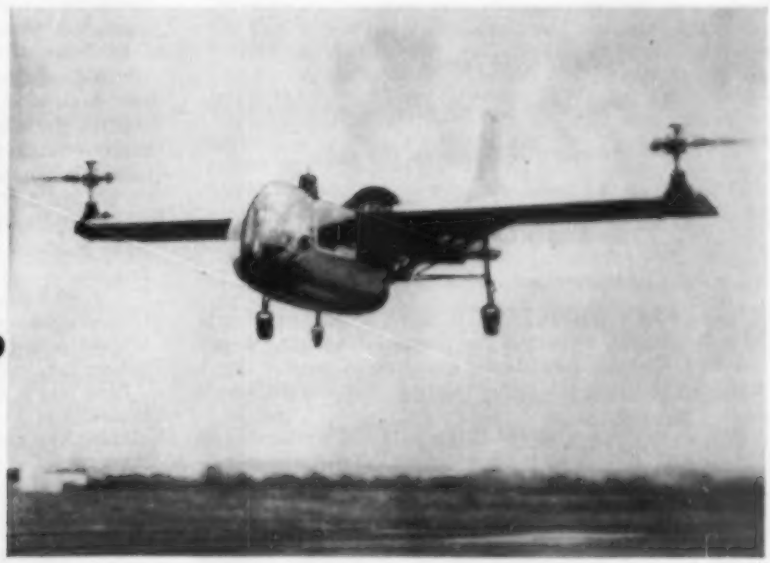
FLY-CYCLE

For sheer ingenuity, this one is hard to beat. Developed by Lawrence Farnham of the Fort Collins Flying Service, Fort Collins, Colo., the Fly-Cycle was designed for low cost, short range utility, light spraying, and sport flying. Of fabric covered steel tube construction, the craft is powered by a Continental A-75-8 engine with McCauley metal prop. Its wing span is 30 feet, length 20 feet, weight about 850 lbs empty, fuel capacity 12 gallons. All controls are embodied in the handlebar. Nose wheel and rudder are steared by turning handlebar in the desired direction. Bank is achieved by banking the handlebars. Elevators are operated by moving handlebars fore and aft. The throttle is on the right handlebar grip and twists open or closed as on a motorcycle. Performance at 5,150 ft. Fort Collins shows take-off at 30 mph in 500 feet with 0 wind; landing at 30 or less in a short space—it can be landed with brakes set and stopped in 100 feet or less. Top speed is 85 mph and it cruises around 65 or 70. Two can sit comfortably as on a motorcycle. In tests so far, no one has felt uneasy about sitting on the outside of the plane (except once when the safety belt was not fastened). They say the Fly-Cycle feels more like a motorcycle than an airplane—even in the air, and further that it's the easiest plane to fly they have ever flown. There are some bugs still to be ironed out but Farnham is considering offering the Fly-Cycle in kit form as well as a factory-built unit.

TRANSCENDENTAL 1-G

Below: Now being flight tested by the Transcendental Aircraft Corp. at New Castle, Del., the Model 1-G Convertiplane has rotor blade assemblies which tilt forward in wing nacelles to convert from a helicopter into an airplane. It has flown without vibration as high as 3,500 feet, has reached a speed of 115 mph as a helicopter. It is powered by a 160 hp Lycoming piston engine. More than 100 convertiplane flights have been made with the ship for a total of 60 hours, including 20 hours of forward flight.

HAVE YOU SEEN?



Above: Pleasant Hill Lake landing strip with sand swimming beach and boat docks at left. Inset: Bob and Paul Spear wore swim trunks under clothes while flying from Cleveland in their Aeronca for quick dip at the lake front airstrip.

OHIO AIRSTRIP

is built with funds raised by taxing private aircraft to promote aviation in the state.

By ROBERT W. STAILEY

TOO OFTEN WHEN POLITICIANS levy a tax on private aircraft, owners of the planes can kiss the money goodbye. The revenue usually goes into a "general" fund, and private flying too seldom derives any benefit, direct or indirect.

Not so, perhaps with the three-year-old license tax in the state of Ohio. This tax is based on the carrying capacity of the plane—three dollars a seat—and about $5,000 of the money thus far collected has gone into building a landing strip beside one of north central Ohio's well-stocked fishing spots named Pleasant Hill Lake. Located near Mansfield, Pleasant Hill Lake is an easy hop from almost any airport in Ohio and an interesting cross-country destination from outside Ohio.

The airstrip itself is 2,000 feet long, with clear approaches over water when landing to the northwest, and a small rising hill at the other end. Pilots are advised to take off and make landing approaches over the water when there's little wind.

Parking and tie-down area is large enough to accommodate 50 airplanes, and it's a short walk to the boat rental dock, a sandy swimming beach, and 12 state-owned log cabins which are rented to vacationers.

Drainage tile and snow fences have been installed, which should help keep the airstrip in good condition the year around.

If the landing strip proves popular with Ohio pilots, the State Aviation Board plans to build similar landing areas near other state-owned lakes and in other state parks.

"We are determined to see the money from the sale of licenses go to *promote* aviation in the state, as well as make it safer," said Mark Savage of the State Aeronautics Bureau.

C. A. E. Brown, State Aviation Director, points out that Ohio also has completed an air marking program and has printed a state airport guide with funds from aircraft license tax.

Ohio pilots, meanwhile, have begun to look a little less cynically at the decal stuck on the vertical fins of their planes. The day may not be too far off when they'll have their choice of many convenient lake strips for a Sunday afternoon of fun or a vacation at a fishing camp.

And if this idea of promotion should ever come abreast of the traditional frenzy for taxation and regulation in the land . . . well, that will be the day. END

NO. 184

I learned about flying from that !

Did you ever make a radar let-down? This pilot did it the hard way.

By A. W. SPEDDING

WITH 15 YEARS AS a private pilot, I had complete confidence in my ability to recognize "border line" conditions. That is, up until a few weeks ago. I have always been proud of the 180's I could perform at the right time.

Like the majority, I have never been able to put time and money together to acquire an instrument rating. At the time of this recent experience, my log book showed a scant 18 hours on instruments, most of which was accumulated in Los Angeles haze, night flying, and flying "on top" over coastal fogs.

This incident began with an afternoon business meeting in Oakland, Calif., and a dinner date that evening in nearby Concord—normally an easy ten-minute flight over an area with which I am intimately acquainted. I arrived at the Oakland airport at 6:40 p.m. It had been raining off and on all day and was one of those cold, black, wet nights. Ceiling at Oakland was 1,800 feet, however, and there was little doubt in my mind that I could easily find Buchanan Field in Concord. After all, it was just a hop and a skip across the hills.

I resurrected a flashlight, stowed my briefcase, and made my usual inspection of the 125 *Swift*. Gear okay, antenna okay—drain sump—gas, quarter full! Enough to make the flight, but maybe—yes; let's fill it up. (How I gave thanks for that decision one hour later.)

At 7:15, with everything set and tower clearance, we purred out over the city. Street lights reflecting on the overcast made the cockpit bright as day. At 1,500 feet, the ragged bottom of the overcast began to engulf the *Swift*.

Oh-oh, Oakland Tower calling—. "The adjacent hills are in the overcast—." Well, no problem there. We'll just skirt the hills following the bayshore line around Richmond, up the river, and into Buchanan. This route may take another five minutes but, with the shore and highway lights, it should be a cinch. Over Berkeley, Richmond, Martinez—and then the city lights of Concord came into view. A welcome sight. The ceiling here is really low and ragged, with scud occasionally moving across the ground creating a zero-zero condition as it floated by. No time to fool around with any traffic patterns at this field.

Certainly no one will be flying in this weather, so let's get oriented over the city for a straight-in approach. The control tower has not been in operation here for some time, so no help here. A circle over the city lights, hold that heading, let down now—600, 500, 400, 300 feet—where are the runway lights? Can't even see the beacon and we're lined up perfectly within a half-mile of the apron! The ground lights of the city have now slipped to the rear and nothing but blackness ahead. If it only wasn't raining I could see a lot better—maybe the field isn't lighted tonight—but of course it would be. This can't go on much longer or I'll be into the hills on the far side. Now down to 200 feet and still nothing but blackness and rain. Let's keep the gear up until we sight the airport—just in case we have to get out in a hurry.

We're in the soup—no wonder I couldn't see the airport. That low scud moving across the ground had enveloped the entire area. Pour on the coal and let's get out of here, nothing but a glow around the wing lights—no sign of anything else. You've really got yourself in a mess! No time to get rattled, settle down and think carefully.

First, let's see if we can get back VFR. The city is directly to our rear and we know the ceiling was at least 800 feet as we came over. Trim back and climb on course to 700 feet—level off—now a 180° turn to the right toward the river. Please, no rough air now. Hold that needle just a width off center, now time it! Get the flashlight quick—!

After a frantic one hand search, (*Continued on page* 54)

Check Pilot Report on the Cessna 310

(Continued from page 27)

the rear left engine cylinder. For cold weather an oil dilution system is available at extra cost.

Fuel is supplied from the two rubberized, bladder-type fuel cells; one located in each tip tank. Fuel is fed through an electric booster pump, a fuel selector valve, a fuel strainer, and through the engine-driven fuel pump to the carburetor. Total fuel capacity is 102 gallons, 51 in each tank, of which 50 gallons are usable. The electric fuel booster pumps located in the tanks give a positive flow in emergency, in event of failure of the engine-driven pumps. They also furnish the necessary pressure for priming and starting and are operated by switches located on the instrument panel. They should always be used during take-off and landing. When the engines are running, the unused fuel is returned from the carburetor to the fuel cells through vapor return lines. The fuel selector valves are located on the floor between the front seats and are well marked and in plain sight of the pilot. The fuel system in the 310 makes it next to impossible to have gas fumes in the cabin at any time.

Electrical energy is supplied by a 24 volt, direct-current system, powered by two engine-driven generators. Two 12-volt storage batteries, connected in series, are located in the wing just outboard of the left engine nacelle and serve as stand-by power source when the generators are inoperative. All of the electric systems are protected by circuit breakers.

The wing flaps are of the split type, electrically operated, and can be extended to an angle of 45 degrees. Up to the first 15 degrees of flap will provide lift. There is no manual system for lowering the flaps.

The landing gear is electrically controlled and fully retractable. After the gear is up and locked, wheel-well doors completely close the wells. For manual operation, a hand crank beside the pilot's seat requires approximately 60 turns to lower the tricycle gear.

Brakes are of the conventional hydraulic type. A parking brake control is connected to the pilot's brake pedals by cables.

Blinker type navigation lights are installed. A feature I like is that one can observe, from the cockpit, the operation of the wing tip lights through small holes in the inboard tip of the light housing. A retractable landing light is mounted in the bottom of the left wing. One for the right wing may be obtained as optional equipment. A taxi light, mounted on the nose gear strut, may be purchased, if desired.

And speaking of convenience—coat hanger hooks in the cabin ceiling above the back of the rear seat and a large baggage shelf, reachable without interfering with rear-seat passengers were new to me. The baggage compartment itself is spacious and located for convenience in loading luggage and cargo.

Starting of the engines is conventional. Only a short warm-up period is required. Ground riding characteristics of the airplane are very comfortable. The nose wheel is steerable with the rudder pedals up to 15 degrees, either right or left of center, after which it becomes free-swivel up to a maximum deflection of 55 degrees, right or left of center. This permits use of the brakes and throttles to turn the airplane in a relatively small radius.

Visibility is very good and taxiing is an easy task with this nose wheel steering. It is not necessary to use outboard engine to start your turn and then opposite engine to stop it. You simply set your throttles at approximately 800-1,000 rpm and use the rudder pedals for directional control. It is not required to use excessive brake as one may easily control speed by adjusting both throttles. Brakes are mostly necessary when stopping. Naturally, the use of differential power can be used in steering, but I want to point out that taxiing can be a very simple task even for a novice multi-engine pilot. I found that a fixed power setting made steering and taxiing very easy.

Cessna recommends that most of the engine warm-up should be accomplished during taxiing prior to take-off. Since the engines are closely cowled for efficient in-flight cooling, precaution should be taken to avoid overheating on the ground. Full throttle checks on the ground are not recommended or necessary unless the pilot has good reason to suspect that an engine is not turning up properly.

Your first take-off will, in all probability, surprise you. After lining up on the runway, I permitted the ship to roll forward a few feet to ascertain that the nose wheel was straight. This also permitted us to line up with a mark on the runway, so that we might measure our take-off roll. On this flight I was accompanied by Mr. Lane and one of his employees. We carried 60 gallons of fuel.

With application of full power, the 310 accelerated very rapidly and we were airborne in approximately 550 feet. Only a slight amount of back pressure was necessary to lift the nose wheel as the ship approached flying speed. It is necessary to retract the landing gear immediately as soon as you are airborne. The acceleration is so great that you could easily exceed the maximum "gear down speed" of 130 mph. This airplane goes through the "single engine control speed" so fast that it is of little concern to the pilot.

Our first climb out was made at 140 mph. This is well over the minimum "single engine control speed" of 90 mph. Our rate of climb at this speed proved to be over 1,600 feet per minute at 24 in. manifold pressure and 2,450 rpm, or 75 per cent power. This type of cruising climb proves very efficient in aiding one to cover greater horizontal distance while reaching cruising altitude, thus cutting down average time required to reach destination. It also provides better engine cooling and less engine wear. On climb out, it may become necessary to lean out the engine mixtures, as they sometimes become rough due to too rich a mixture. Leaning of the engines at altitude will provide a more efficient and economical engine operation.

The control forces are light and, with the easily reached trim tab controls, the ship can be flown with a minimum of effort. At 5,000 feet, the aircraft was trimmed for level flight, still maintaining our power setting of 24 in. manifold pressure and 2,450 rpm. This is the maximum recommended cruise speed and resulted in an indicated 212 mph. It is not necessary to use the rudder in the air. Turns can be made nicely with the wheel alone.

Remaining at 5,000 feet, a more conservative power setting of 21 in. manifold pressure and 2,100 rpm, or approximately 52 per cent of power, was selected. This gave us an indicated airspeed of 188 mph. At this power setting, the cabin is fairly comfortable from a noise-level standpoint. From my experience with jets, I have found that increase in airspeed causes increase of noise in the cockpit. The same thing is true in your automobile. If you increase speed from 40 to 60 mph there is added noise. This high speed is probably one of the reasons for the sound level in the 310. Undoubtedly Cessna will shortly do something to lower the noise level. It is not now uncomfortable but it should be reduced.

I had been briefed that propeller synchronization was a problem on the early 310 prototypes. It was not a problem on this particular plane and I thought the propellers did a good job of maintaining synchronization.

Stall characteristics proved normal in both the clean and "gear and flaps down"

(Continued on page 50)

WANTED: IDEAS

Do you have an idea for a new missile? Or a new principle which might revolutionize aircraft design? Or a new material which can stand temperatures that turn ordinary metals to liquid?

If so, the Air Research and Development Command wants to see your ideas and test them for possible Air Force use. In an effort to reduce the time lag between conception of a basic idea and its adoption by the Air Force, the Command's Analysis and Evaluation Office has appointed an Assistant for Innovations. This post is the focal point for receiving and studying ideas from industry, universities and private individuals engaged in research.

Proposals should include description, estimates of expected performance, and explanation of its potential value to the Air Force such as increasing performance, or saving weight or money.

Correspondence should be addressed to the Assistant for Innovations, RDTE, Headquarters, Air Research & Development Command, Box 1395, Baltimore 3, Md.

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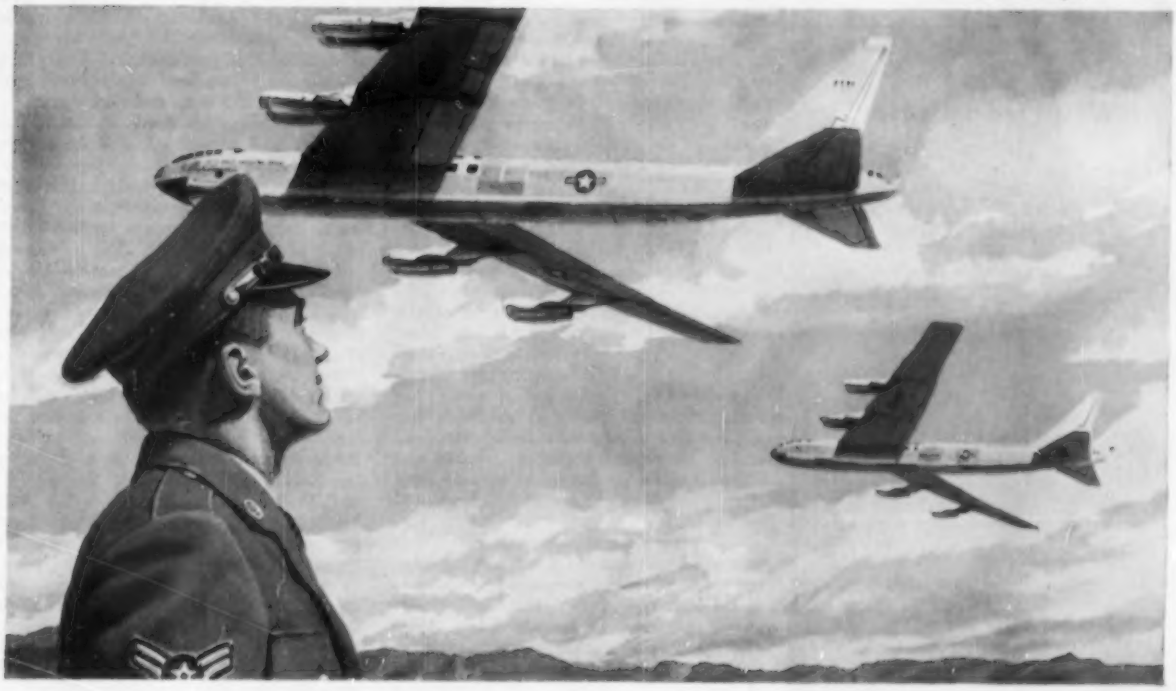

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AFPTR-P-4, U. S. Air Force,
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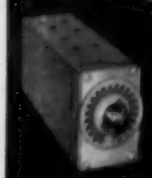

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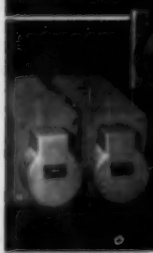

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DARE, INC.

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(Continued from page 48)

configurations. Stalls with gear and flaps up came at 80 mph and, with gear and flaps down, at 69 mph. In each case, sufficient warning was given in the form of mild buffet about 10 mph above the stall. In addition to this buffet, a Safe Flight Stall Indicator gives visual, as well as aural, warning as the airplane approaches a stall. No trouble should be experienced with stalls by a pilot unfamiliar with a high performance airplane like the 310.

After experimenting with the single engine characteristics of the 310, I placed my feet on the floor and pulled the mixture to idle cut-off position on the right engine. There was a slight yaw to the right, but it was overcome by holding the right wing up with the aileron. I permitted the propeller to windmill for a while to see how much drag it created; then proceeded to feather the propeller by pulling the prop control back beyond the stop and into the feathering range. After the propeller was feathered, it was necessary to relax some of the aileron control, since part of the drag was eliminated by feathering. Next I trimmed the aircraft for hands-off flight. At slow cruise, pulling approximately 22 in. manifold pressure at 2,200 rpm on the operating engine, the indicated airspeed was 155 mph. Turns were then executed "into" the live engine and "into" the dead engine with no difficulty whatsoever. Single engine performance was at least equal to or better than the figures quoted by Cessna.

Following this, the propeller was unfeathered and descent was made to enter the traffic pattern. Airspeed was reduced to 130 mph (maximum gear down speed) as we entered the down-wind leg. Since the 310 is such a clean airplane, it takes a little practice to develop a technique of reducing the airspeed and maintaining pattern altitude. As the power is reduced below 14 in., a warning horn blows if the gear is in retracted position. In addition, a red light on the instrument panel glows continuously when the gear is up and a green one when the gear is down and locked.

Gear lowering, like retraction, should be accomplished while the aircraft is flying straight and not in a turn, since turning imposes an additional "G" load which effectively increases the weight of the landing gear. Full flaps were lowered on the final approach. There is an indicator on the instrument panel and the pilot can select any degree of flaps he desires. Final approach speed was made at 90 mph. It can be made with or without power. I prefer the power approach and carried approximately 12 in. manifold pressure until crossing the fence. Flare-out is conventional and I have been informed that most pilots tend to level off slightly high on the first landing. However, this is easily overcome after a few tries. Visibility is excellent from either seat. Landings should be made on the main wheels; then the nose wheel should be lowered after the speed has been diminished. If landing in a short field, the nose wheel should be lowered immediately, so that brakes can be applied as necessary. The same procedure is advisable for landing in a strong crosswind so that nosewheel steering and brakes can be used as necessary.

During another take-off after reaching 90 mph (minimum single engine speed), the right engine was throttled back, simulating loss of that engine. The landing gear was immediately retracted and the dead engine was set up at 12 in. and 2,000 rpm to offset the drag of the windmilling propeller. I did not think it a wise policy to feather the propeller on a simulated single engine climb out. Following the recommended "single engine climb out speed" of 116 mph, the airplane was uneventfully flown around the field and landed. I consider single engine performance of this airplane exceptional.

The 310 I flew contained an Omni, ILS localizer and glide path, low frequency receiver and VHF transmitter and receiver. I am told an owner has a large selection of radio equipment to choose from. Provisions are made for the installation of the lightweight Lear auto-pilot.

This airplane can be operated out of sod fields as well as major airports. Since it has two engines, flight may be continued with a very high degree of safety after sunset. A complete complement of instruments and enough radio gear is installed for instrument flying. Optional equipment which should be installed before much instrument flying includes, De-Ice System (Boots for wing and horizontal stabilizer, including De-Ice light in the left engine nacelle. Propeller Anti-ice System is also available as extra equipment. The reservoir is of five quarts capacity and, when in operation, maximum output is one quart every four minutes per propeller. I would consider this equipment a "must" if much instrument flying is contemplated.

The Cessna 310 is a very high performance ship and flies much like a larger airplane. It is not difficult to fly. However, a new owner should take pains to read the very well written Owner's Manual and then secure adequate transition training before "barging out" on his own, particularly if he has no prior multi-engine experience. END

"Darn roadhog!"

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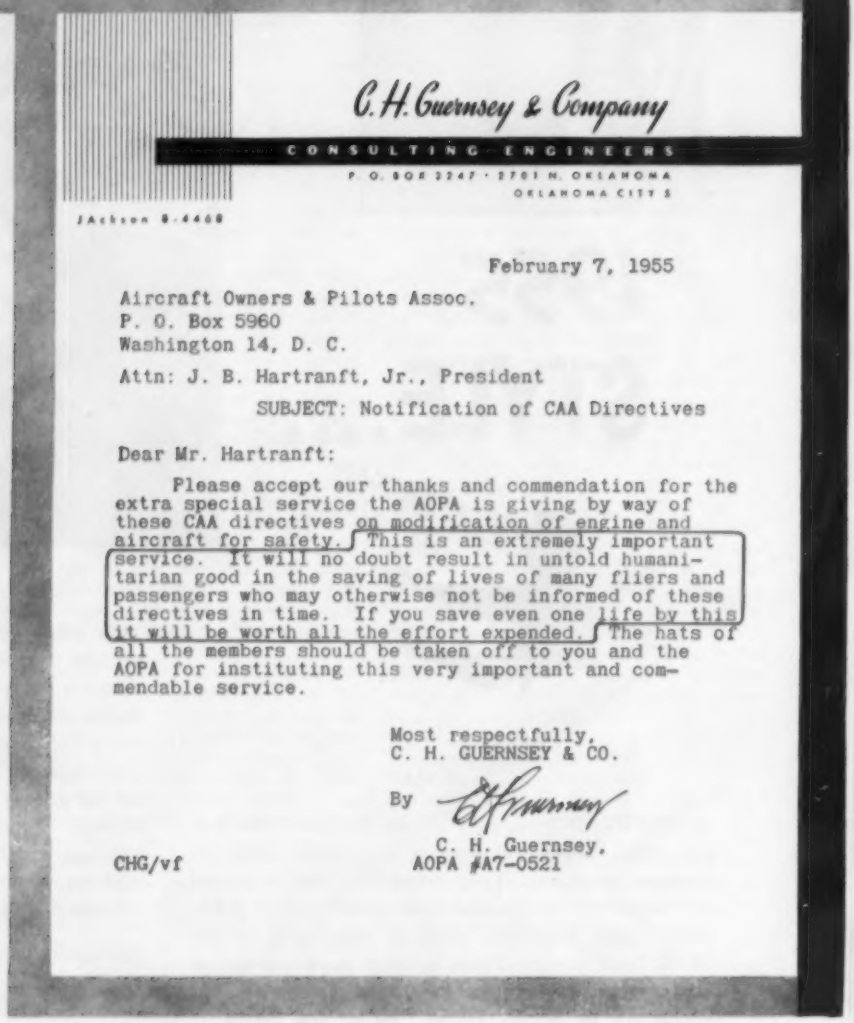

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February 7, 1955

Aircraft Owners & Pilots Assoc.
P. O. Box 5960
Washington 14, D. C.

Attn: J. B. Hartranft, Jr., President

SUBJECT: Notification of CAA Directives

Dear Mr. Hartranft:

Please accept our thanks and commendation for the extra special service the AOPA is giving by way of these CAA directives on modification of engine and aircraft for safety. This is an extremely important service. It will no doubt result in untold humanitarian good in the saving of lives of many fliers and passengers who may otherwise not be informed of these directives in time. If you save even one life by this it will be worth all the effort expended. The hats of all the members should be taken off to you and the AOPA for instituting this very important and commendable service.

Most respectfully,
C. H. GUERNSEY & CO.

By C. H. Guernsey

C. H. Guernsey,
AOPA #A7-0521

CHG/vf

AOPA adds another vital service for ALL civilian pilots

Now—for the first time—all CAA airworthiness directives concerning engine and aircraft modifications are being sent directly to *all* owners of the aircraft involved . . .

. . . Prior to the advent of this new and vital AOPA service, aircraft owners and pilots had no definite or assured method of receiving this important safety information—and, all too frequently owners and pilots were not complying with the urgent, life-saving modifications because "the word hadn't gone through." . . . the letters reproduced on these pages are typical of the many received—all of them expressing appreciation of the new AOPA safety service.

In the interest of safety, these all-important directives are being sent to every aircraft owner, irrespective of whether or not they are AOPA members. AOPA and its 42,000 pilot members take a pardonable pride in sharing this newly inaugurated and vital safety service with aircraft owners and pilots who are not members of the association . . .

. . . However, every new member adds strength to the far-reaching AOPA program—gives weight and unity to our efforts of making your flying

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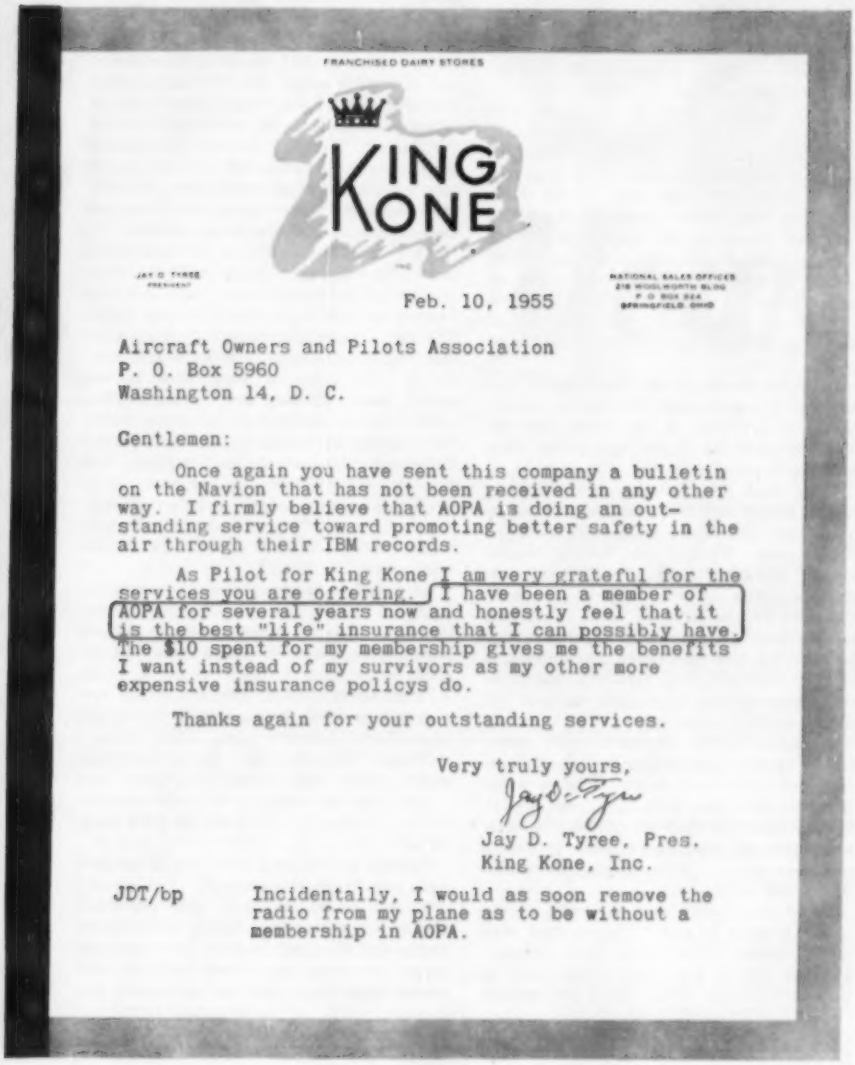

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Feb. 10, 1955

Aircraft Owners and Pilots Association
P. O. Box 5960
Washington 14, D. C.

Gentlemen:

Once again you have sent this company a bulletin on the Navion that has not been received in any other way. I firmly believe that AOPA is doing an outstanding service toward promoting better safety in the air through their IBM records.

As Pilot for King Kone I am very grateful for the services you are offering. I have been a member of AOPA for several years now and honestly feel that it is the best "life" insurance that I can possibly have. The $10 spent for my membership gives me the benefits I want instead of my survivors as my other more expensive insurance policys do.

Thanks again for your outstanding services.

Very truly yours,

Jay D. Tyree

Jay D. Tyree, Pres.
King Kone, Inc.

JDT/bp

Incidentally, I would as soon remove the radio from my plane as to be without a membership in AOPA.

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I Learned About Flying from That!

(Continued from page 47)

I extricated the light from the adjacent seat belt, sweater, and map; too late to time now, shine it on that needle, remember—all instruments have panel lights *except* the turn and bank, manifold pressure, and compass. Never thought it too important before, as I never planned to use them under conditions like this.

Count off the seconds, now put the needle back in the middle—easy—check the compass — close enough — hold the heading and altitude and pray that we break clear over the city. Don't look away too long. Don't forget to check the manifold pressure; we may pick up ice in this soup. Don't over control. Where are those city lights? Must be right on top of them by now. Can't hold this low altitude for more than a minute or so or we'll be in the hills on the far side of town.

Let's face it, we must climb out of this without flying through Mt. Diablo on the south or the hills on the west, and yet keeping south of Travis Air Force Base traffic a few miles north.

Trim back for normal climb, hold a needle-width left turn, and spiral up to 5,000 feet. That should clear all obstacles in the area. What a cold feeling—deliberately climbing up into instrument conditions. Turn on the radio and tune in Oakland Range, let's see what conditions aloft are. Please don't let there be any ice. With a low frequency transmitter, it is very unlikely they can hear me from this distance, but we're just in time for their regular broadcast.

"Oakland—1,600 overcast—6,000 overcast"—oh—oh—the tail end of the broadcast, not much help there. What a beautiful friendly tone from the range signal. Makes you feel that there is some hope even though you can't talk to them. —· —· —· That checks, we're still in the NE sector.

Hey—the needle is way over to the right! It must be nuts! I know darn well we're making a left turn! Still—remember the article you read about trust in the instruments. Okay, don't get excited. Turn the wheel opposite what you "feel" is right and get the needle back where it belongs. There it comes. Thank God for little things.

Finally the altimeter slowly dragged around to 5,000 feet. Let's level off and see where we are. Heading 070. Still getting a strong "N" from Oakland range, so let's take a 180° heading toward the bay area and sooner or later we should intersect one of the range legs. Tune it down and be sure we're headed toward the station. Check the time. We should still be over the Concord area in which case we should cross Oakland in 10 minutes. Let's hold this course until we can communicate with the range station.

"Oakland Radio, this is *Swift* N78119, over." No answer. Keep calling every minute or so until they reply. We're headed in the right direction all right. The signal is getting stronger. Keep calling. Still no answer. Why don't they reply? We must be very close to the station now. If they don't answer soon —I'll have to let somebody know we're here before we tangle with traffic. Twenty minutes on course and nothing but my own voice echoing in my ears. Can't keep this up any longer so let's call anybody in range. "Any CAA Communications Station, this is *Swift* N78119 receiving on 362, over."

An immediate reply came booming in —"*Swift* 78119, this is Oakland Radar Control. Over." What a sweet sound! Never had anyone's voice sounded so good.

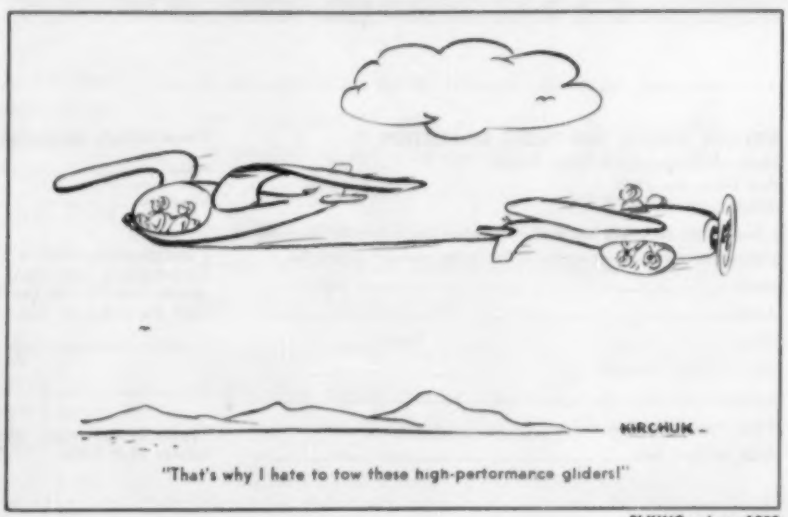
"This is *Swift* 119, I'm caught in the overcast at 5,000 feet, can you direct me down?"

"Roger 119. Do you know approximately what your position is? Over."

"119 estimate position to be in vicinity of Bay Bridge, heading 180 at 5,000 feet. Over."

"Stand by 119, and we'll see if we can pick you up in the scope."

Such a relief, having that professional and efficient sounding voice. If they can clear me through traffic, I'm sure we could let down okay—but they are the bosses now. Hey look, we just broke out



"That's why I hate to tow these high-performance gliders!"

between layers! The top layer is thin and occasionally a star twinkles through. What a black night, though. At least now I'll be able to see other aircraft at this level. Several deep glows are showing up in the lower strata indicating large cities down below.

"*Swift* 119, this is Oakland Control—Over."

"*Swift* 119, Over."

"Make a 360° turn to the right."

"119, Roger."

Now let's show them we can do it. That's it. Just one needle-width. Hold your altitude. Don't over control. Okay.

"Okay, 119, we have located you. You're 11 miles north of Oakland. Hold your present heading. Can you make an instrument approach? Over."

"This is 119, Roger. Have never made instrument approach, but am familiar with procedure. Have only needle, ball and airspeed—no gyro—Over."

"Roger 119, how much fuel aboard—over?"

"Estimated 1 hour and 20 minutes."

"Roger, Oakland traffic is very heavy. We'll take you over San Francisco. They are reporting a few breaks in the overcast. Turn to new heading 295—Over."

Now we're a lot more comfortable about the whole thing. Never did I expect to experience a let-down by radar. From stories I've heard, those control boys really know their business, so let's follow through and make it as easy as possible for them.

For some indeterminate period new headings were received along with various bits of weather information, until at last a few small lights appeared through a small break in the overcast. Then Control advised we were directly over the San Francisco airport, and to let down through the hole if possible and report when at 2,500 feet.

A few quick reports and instructions, change of headings, etc., and suddenly—we were VFR right on top of the San Francisco airport at 1,000 feet. What a wonderful sight to see those lights and to be able to pick your eyes off the panel and put them back in your head.

"*Swift*—119, fly 060° and report when in sight of Oakland. Over." Five minutes later and down to 800 feet to stay VFR, the Oakland beacon and runway lights came into view.

"Oakland Control this is *Swift* 119 now in sight of the airport estimated four miles east at 800 feet—Over."

"Roger 119, you are cleared straight in on 27 R. Over."

One hour and 55 minutes from take-off, I rolled in. After parking and counting my lucky stars, I found a telephone and poured out the complete story to the Control Tower.

After all the listening, reading and preaching I've done about border-line weather, I sure felt silly to become a victim. For the benefit of all other pilots, especially those who have had enough experience to feel they can push their luck occasionally, please don't think that it can't happen to you. It can, and it will. For heaven's sake, either bring up your instrument proficiency or take no slightest chance with weather. END

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THE CAMAIR 480

NEWEST OF THE LIGHT-TWIN class of executive aircraft, the Camair 480 (see front cover) is a *Navion* conversion with so many improvements as to be virtually a remanufactured airplane.

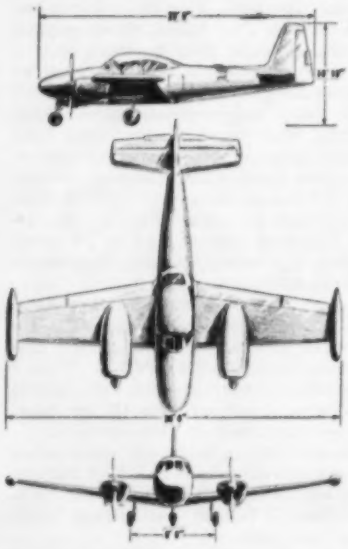
Powered by two Continental 240-hp engines, the 480 has dual electrical, fuel, vacuum and hydraulic systems. Hartzell full-feathering, constant speed props are standard equipment.

Wing tip tanks of 35 gallon capacity each are an outstanding feature of the 480, tripling available fuel and giving the plane a 900 mile range.

Instrument arrangement has the flight group on the left, engine group on the right and radio panel in the center directly over the pedestal. All switches are overhead.

Specifications as listed by Camair indicate a gross load of 3,930 lbs; 192 mph cruise on 70 per cent power at 6,000 ft; sea level rate of climb on two engines of 1,750 fpm, and 450 fpm on one engine; 22,000 ft service ceiling on two engines, and 8,000 on one engine; 900 mile range; wing loading 21.3 lbs per sq. ft; power loading 8.2 lbs per hp; useful load 1,200 lbs; fuel capacity 108 gals.

Owners may convert their *Navions*, trade them in or make an outright purchase from Camair. Price for outright purchase is under $40,000. Tip tanks, one radio and all necessary flight and engine instruments are standard equipment.



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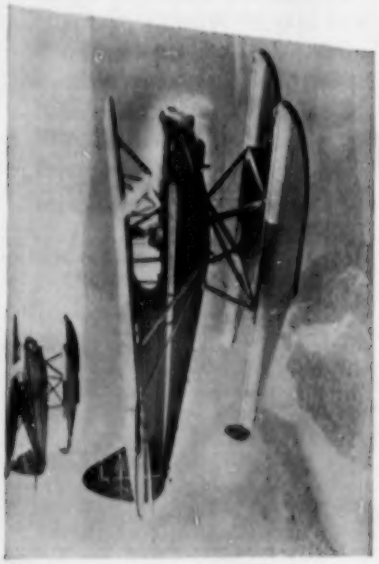

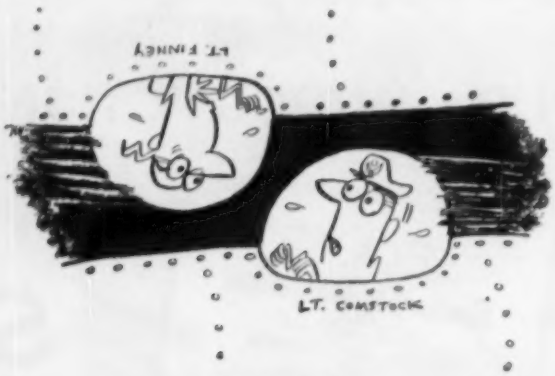

CLOSE CALL

THERE I WAS, flat on my back in a P-38 at 15,000 feet, "stalled out." What's exciting about that? Nothing, until you consider that no more than ten feet below me Lt. Frank Comstock was "making eyes" at me through our canopy tops. We were back-to-back. It wasn't very romantic.

They say that your past flashes before you at such moments. The only thought I had time for was, "How the heck did this happen?" I pushed hard against the control column with both knees to keep the nose up, covered my head with my arms and waited for the end.

The answer to my mental question is the most valuable lesson of my life. On land, on sea or in the air—no driver, helmsman or pilot ever knows what the other fellow will do next. To assume that he does only leads to bloodshed—or heart failure.

It was June, 1945. Lt. Comstock and I were newcomers to the 30th Fighter Squadron, Howard Field, Canal Zone. We were both still fledglings of about ten hours fighter experience the day the Operations Officer took us out for a progress check.

The Major put us through a good workout of acrobatics in a follow-the-leader string formation. Then he ordered me to lead for awhile. That was my first mistake. I moved forward. He dropped back to last position.

What glory! I exhibited my leadership abilities and flying skill. I'd show him a few things. As we sailed through a loop and rolled out of an Immelmann, I thought, "If a T-6 will do a double snap roll on top of a loop," (my specialty back in flying school), "then a slow roll on top should be easy in a '38." That the complete roll might surprise those behind me never entered my mind.

I built up speed in a screaming dive and hauled back. Up, up, up! I started the roll. When half a turn was completed, the nose still pointed straight up. I had rolled too soon. My speed was dropping off too fast. I had to get her on her back before she whipstalled. I sucked back on the wheel, added more aileron and rudder. Too abruptly! She shuddered and snapped over. There I was, flat on my back, helpless!

There too, close enough to touch, was Lt. Comstock, looking startled. He had assumed we were doing another Immelmann. He rolled level just as my ship snapped. His speed took him directly beneath me.

How he got out from under is his story. I had my eyes closed. He said the next few seconds were the busiest of his life as he dove frantically and skidded to one side. He watched me fall past him with only inches between our wings.

Those seconds, waiting for the crash, were the longest hours of my life. Nothing happened. I opened my eyes to discover I was alone, diving earthward inverted. I recovered, pulled up and looked around. When I spotted the other two ships, I breathed a thankful, "OOOooohhh!!" into the microphone. It was answered immediately in the same tone of sigh. The Major disgustedly barked the understatement of a lifetime . . . "Wait a minute, Finney—you've lost Comstock."

—BY ROBERT FINNEY

Sharpshooting Guard

(Continued from page 37)

warmed up for 30 minutes before they took off on the gunnery and bombing missions each day. A small thing, but when they got in the air, the sight was ready. Then there was the fact of the radio truck. Only one other team had the foresight to send a pickup with a two-way radio installed. The 140th sent Sergeants Lucero and Price on a thousand mile trip over the mountains just to have the added "plus" of air-ground contact—and it provided a bit of the margin that meant victory.

The winning team's training was begun at summer camp at Casper, Wyo. There Williams, Sands, and alternate pilot Capt. Mel Conine, took top honors in a wing

gunnery competition and were selected to represent their states' squadrons. In Casper, the armorers were broken in, the chew chiefs got needed experience, and the pilots grew familiar with the F-80, which they had received as replacement for the antiquated F-51, less than a year before. During September, the pilots flew back to the Casper range several days each week to develop techniques, test their methods, check gunsights, and to see "how the ships were shooting". One day at Casper, Williams' plane was "shooting" pretty well. It—or he—shot a "hot" 77.7 per cent score.

During final week before competition at Boise, Williams, Sands, and Conine concentrated on dive bombing, rocketry, skip bombing, and air-to-ground gunnery and began to realize that ground gunnery was all-important if they were to win. They anticipated that a 30 per cent average air-to-air, with an outstanding average air-to-ground, would win. And that is exactly what happened.

The "sweat" began on Saturday, October 2, when the teams arrived at Boise. They spent the day getting all personnel acquainted and assuring that crews had everything needed to operate efficiently. On Monday morning, practice began. It was "wheels up" at 7 o'clock with each team getting in four or five warm-up missions. Monday and Tuesday practice sessions were a big help to Williams, Sands, and Conine, who although they shot low scores, learned the layout of the range, oriented the checkpoints and figured procedures. They also learned the de-arming areas, the traffic patterns, the parking areas, and the availability of tools and equipment, oxygen and fuel.

On Wednesday the "big sweat" began. Right off the bat the Colorado Wing pilots got a break, for they shot their first and third tow-targets off the tow cable which meant they would be allowed "makeup targets" at the end of the meet. (The tow-target is rectangular, 30 feet long by six feet high, and is made of nylon. It is towed behind a jet fighter at about 230 miles an hour.) This meant that they had actually gotten in two extra practice missions. The target score on the first day of actual competition was not good, not bad; they averaged about 30 per cent hits, as expected. On Thursday, the ground phases began, and Williams and Sands tangled with competing *Sabrejet* Wings in skip-bomb, dive-bomb, ground-gunnery, and rocketry brackets.

Competition was shaping up now and the strain was tremendous, not only on pilots but on ground-support crews and even on the civilian and military spectators who were "rooting home" their favorites. The toughest part of every mission was that, if you aborted (couldn't take off for your mission), you lost all the possible points you could have scored. It was on one of those "almost-aborts" that Sgt. Tony Lucero proved his weight in gold.

But let Williams tell it: "One incident shook me up. Regulations said you couldn't fly a gunnery mission unless you had radio contact. Well, I was taxiing out ahead of Sand and heard some com-

(Continued on page 60)

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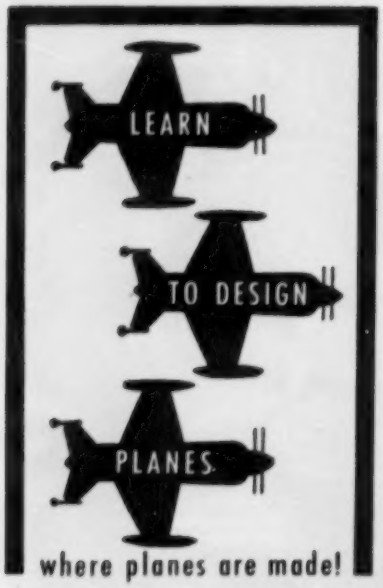

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(Continued from page 59)

motion on the radio. I thought it was some guy goofing. Thank the Lord, Tony was sharper than I was. He was sitting in the pickup, listening to the radio, which was his job during missions so we could tell him if we had any difficulties. He caught the foul-up right away and started for Sand's take-off position. As the planes from the Alaska outfit had to stop to charge their guns, I turned around and noticed Tony had the gun bay door open and was working frantically on the radio compartment of Sandy's plane. He made major and drastic repairs in that radio about as fast as it takes to tell it . . . changed crystals, made necessary adjustments, and checked it out. He saved the mission."

Tony wasn't the only one who was on the ball. "M/Sgt. Harry Scott, the armorer, was out to win that meet if he had to fly the '80' himself," says Williams. "Every time we'd land, the procedure was to cock the nose away from the hangars and have the armorer reach in and manually clear the guns to prevent a possible accident on the ground. The way that Scotty would lift that door and gaze in was something to behold. He would open it slowly and peek in, as though he were looking at the face of death itself. If there was still ammo in the plane, that was, of course, a black mark against him. But when he'd see there'd been no jam, he'd get a big smile. Needless to say, the pilots were hanging out of the cockpits at the same time trying to look over his shoulder.

"We got a bad batch of rockets one morning. Scotty looked and said, 'They'll never last; we'll pull the plugs out because, if we don't, the plugs will blow out in flight and won't fire.' (Instead of being made with plastic, the plugs were made of soft pot metal.) When the other outfits saw the rockets, they shrugged and said: 'Well, that's what they gave us, and that's what we'll use.' But not Scotty; he put an emergency fix on the rockets in the form of ten loops of heavy safety wire to make sure the plugs would hold in there whether they broke or not, and consequently, we fired every rocket. Considerable difficulty was experienced by other teams owing to this malfunction.

"Out of the entire gunnery meet, Sandy and I had 2,880 rounds of ammo apiece and only four rounds didn't fire. All of our bombs and rockets fired. Man, that's real ground support. You can chalk Scotty up with a perfect mission."

Sands' and Williams' skip-bombing runs, which came on Friday, were what put them in the running. Sands hit four for four and Walt hit three for four—175 points out of a possible 200. With two make-up missions to go, the 140th became the dark horse. In the afternoon the Colorado Wing suddenly caught the attention of hundreds of people who were watching scores being posted. No one had really seriously considered an F-80 outfit, with so many hot *Sabre* teams entered. Colorado was really picking up rooters now—teams already out of the running, teams that wanted to see the hot California outfit—victors the year before—defeated; technical representatives of Lockheed, and just plain people who like to root for the underdog.

By the end of firing on Friday, when all regular missions had been completed and only the "make-ups" remained, California was out, and the fight was between Colorado and Washington Wings.

But, as if that was not enough to sweat about, there were still the gremlins. "On the next to last mission the pressure was sure stiff," said Walt. "I had just started up and was taxiing out when the emergency fuel checkout switch in my plane went bad. The engine quit cold when I pressed the toggle. All I could think was, 'We've had it!' I started waving frantically for assistance from the line, giving the standard signal by rotating a forefinger that I need an auxiliary power unit (APU) to get another start. If things hadn't been so tense, it would have been funny, because when the boys started to roll the APU out to me, everyone started to push—General Moffitt, the Des Moines team, the tech reps and even civilians were shoving. And the funny part is that an APU is self-propelled. You can't shove it faster than it wants to go, but you should have seen 'em try.

"Then we had to drain the tail pipe. General Joe was up there with a whole bunch of people and, when I gave the signal, you've never seen such a tail-raising in your life. I was afraid they were going to bash in the tail pipe. But they got me started and I made a pretty fair score. Trouble was, there was no end to the pressure. I came in to land for gas and ammo for the last make-up mission and, sure enough, my gunsight was out. In the landing pattern, I called

HEAVENLY DUST

Collecting meteoric dust, scientists from the University of Arizona's Institute of Atmospheric Physics are exploring a theory developed by Australian Physicist E. A. Bowen that rain triggered by meteoric dust will fall on certain dates. Daily dust-gathering flights were made in Lockheed *Hudsons* of Gordon B. Hamilton & Co., Tucson, Ariz.

Tony in the pick-up truck and told him about it.

"When I landed, they had the equipment set up, the jacks, the power unit, and all the parts so we could do our darndest to fix it in time. With the big victory practically in our hands, it looked pretty black. Then Scotty pulled his head back out of the cockpit. 'I don't think the sight is bad,' he said. 'Let me check for a minute.' In less than that, he had found a loose connection and we were back in business again." In the few minutes remaining, Walt "scrambled" upstairs for a quick check test and found the sight was working fine.

Colorado finished its make-up mission Saturday afternoon before Washington. But still the "big sweat" wasn't over. If the Coast boys could fire 50 per cent on their last flight, it would be "all she wrote" for the F-80 Wing. Williams and Sands couldn't stand the tension any longer and went back to the barracks, ostensibly to sleep, but really to lie in the sack and perspire.

"Col. Bud Cooper of Cheyenne and General Moffitt, who had been at the board waiting results, left as soon as they were posted, and took off down the company street with horns blaring. Sandy and I, pretending to be asleep, heard the horn, and, knowing that Cooper had one of the few staff cars on base, we thought: 'This is it!' Sure enough, it was."

Maj. Arch Curran, regular Air Force Advisor to the Colorado Guard, was first man to the door of the barracks. "He grabbed me and swung me in the air like a two-year-old," says Williams.

"We headed back for the ramp and met the pilots from Washington's 144th Wing, Maj. Kenneth Nordling and Capt. Howard.

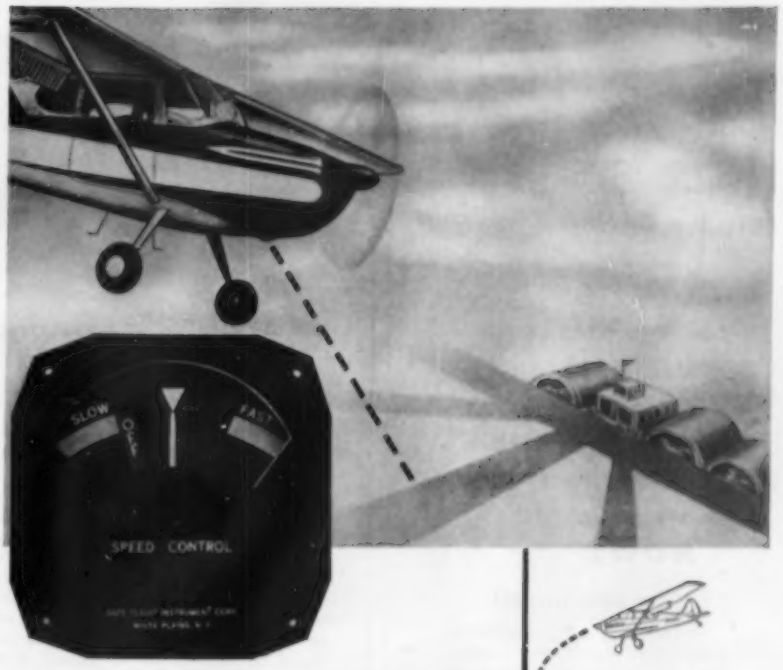
"'Well,' they said, 'we'll buy you a drink.' They were the best sports I've ever seen. Personally, I couldn't have been as good about it if we had lost."

There were celebrations all around—especially when the 140th found it had won *Sabrejets* by winning the meet.

The Las Vegas competition this fall is for radar gunsight-equipped planes only, and the winner of the ANG meet had been promised that it would represent the entire Air Guard. Consequently, the Colorado Guard started taking delivery on radar-sight *Sabres* this spring. "General Joe," Walt Williams, Bob Sands, and the boys out this way are overjoyed at getting the *Sabres* but they will never forget what the old F-80 did for them when the chips were down. The 15 trophies the 140th won (out of a possible 21) at Boise, had miniature swept-back *Sabres* mounted on them. That fact the "hottest gunners in the Guard" smilingly resent. They wish all those trophies had straight-wing F-80's mounted on them. It wasn't fair to the faithful old "80."

But sentiment won't stand in the way of their flying the buckets off the *Sabres*. The 140th is out to show the regulars that the hottest gunners in the Guard can also be the hottest gunners in the Air Force.

It could be. Come September there may be a lot of flying folk "plenty shook in Las Vegas." END



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OLD HODGEPODGE

SKYWORN and air weary but still full of flight, the granddaddy of Lockheed jets dodged the junkman's grimy grip and flew proudly from California to Griffiss Air Force Base, Rome, N. Y., to sit out the rest of its life as a non-flying instrument of secret technical study.

Many times modified and too often patched in seven years of aerial contortions, "Old Hodgepodge" is a research plane that was built in 1947 as an F-80A *Shooting Star*. It was then sliced in half to be expanded into the world's first jet trainer, the two-seat T-33. Then it got new engines and radar to become the first F-94A interceptor. Next it donned a new kind of wingtip fuel tank and was the F-94B. Later it took on and tested electronic and rocket inventions designed for the F-94C.

Moving from scientific job to scientific job, Old Hodgepodge became an unrecognizable conglomerate. Pilots tried to fly its wings off in stability, spin, speed and dive tests. On one derring-do mission, it was purposely flown in zero visibility through cloud, cold and night when all other planes were grounded . . . just to ice up the wings and test foul-weather performance. That night lightning struck and burned a hole in the wing, but Old Hodgepodge flew on in full control.

Eventually, of course, the plane's test role faded and it became too fat and sluggish for arduous scientific duties. It was more of a crazy quilt than a magic carpet, no longer fit for any Air Force squadron. At the end it had to carry 1,000 pounds of ballast in its nose to maintain balance in flight. Takeoff weight was up to about nine tons instead of the original seven.

Into the blue she knew so well, the old plane has flown off to anonymity, but . . . to her everlasting credit . . . she got there on her own power and on her own wings.

Mamba!!!

(Continued from page 21)

was asking anxiously.

My tongue clove to the roof of my mouth as I tried to speak; my lips were as dry as sandpaper . . . as hot as the sunscorched earth below us.

"Can you hear me, Dick?" his voice came again.

"Yes," I croaked, then, "snake . . . snake."

"What? Is something wrong?"

"Snake behind me. Come quick, quick," I whispered. "Bring something. Black Mamba."

"Holy cow!" I heard him gasp. I wanted to turn my face and look at the snake but was scared that the motion of my head might make it strike.

Gradually now, I maneuvered my eyes until I could see the swaying black head still within a foot of my back. Then I heard Tommy. I saw the snake poise and draw back its head. This was it. I knew the blow was coming.

"Hang on," I screamed, "I'm going to dive," and before Tommy had time to reply, rolled the plane on her back.

For two or three seconds I flew in that position, then righted her and went into a dive. Now I looked back. The snake was on the floor and trying to get its balance.

I saw a groggy Tommy, his nose and mouth bleeding, move forward, hanging onto the ribs of the plane, a wrench in his hand. Then, to give him a chance, I flattened out slowly.

Behind me I heard the crash of the wrench again and again. Then Tommy stumbled against my seat.

"You badly hurt?" I asked. "Sorry I had to do that, but that snake was going to strike."

"Okay, Dick," he muttered through his split lips. "I hit my jaw; nothing serious. Take it easy boy—you're all right now, I killed it."

We touched down 15 minutes later and Tommy went off to the first-aid office to get himself fixed up. With trembling fingers I lit a cigarette and watched as two African laborers took the battered Mamba out of the plane. Gingerly they handled the deadly reptile. It was over five feet long.

I am still flying in East Africa but, before I go up these days, I make a point of inspecting my plane. I want no more of that. It was not reasoning that saved me. It was nothing but sheer luck. Ninety-nine times out of a hundred the Mamba would have struck. END

Free Ballooning

(Continued from page 41)

petitive elimination. To become qualified in the free balloon phase of training, six flights of at least one hour duration each must be flown by each man. Then he must solo at least an hour.

A typical flight proceeds like this. One of the veteran qualified pilots and three students take off from Wingfoot Lake. After an hour in the air, a landing is made in some convenient open field. Three other students, who have been following the balloon via highway in a station wagon, replace the three who made the initial hop and go up for their hour of flight training.

Normally two such hops are all that may be accomplished with one filling of a 35,000-cubic-foot balloon. Gas has to be valved out each time the balloon comes down. This reduces the lift or carrying capacity. Ascent in a free balloon never is attempted unless there is sufficient lift to carry several bags of sand in addition to the pilot and other personnel in the basket. It is necessary to discharge weight in the form of sand to gain altitude, slow speed of descent and to ease landings.

A balloon's vertical movements are controlled by releasing gas through a valve in the top of the bag or by dropping sand or weight in any other form. At the start of a flight, sand is removed until the balloon starts to rise. If ascent is slow, or sluggish, rate of climb may be accelerated by dropping more sand.

If the balloon continues to climb when desired altitude is reached, gas is valved to stop the climb. If too much is valved at this point in the flight, the balloon will begin to come down. To arrest the descent, sand would have to be dropped. A balloon that has just the right balance between lift and the load being carried, is said to be "in equilibrium," or in balance. Such a balloon will tend to maintain a fixed altitude.

Other factors influence a balloon's balance. A strata of cold air will cause the sensitive gas to contract a bit and start the balloon downward. So will the shadow of a large cloud if the balloon has been flying in direct sunshine. Or, if the balloon has been flying in overcast and emerges into sunlight, it will promptly begin to climb.

Horizontal direction is dictated entirely by the direction of the wind at the altitude the balloon is flying. To travel in a predetermined direction, a balloonist must know at what altitude the wind is favorable, then ascend to that level.

Balloon training for prospective blimp pilots is both logical and important. Any gas inflated airship or blimp, should its motors fail while in flight, would have to be flown and landed in the same manner as a free balloon—since that is what it would be under such circumstances.

When the successful candidates complete their balloon training and qualification, they are eligible for actual blimp flight training. Ground school for a group of embryo airship pilots is a 150-hour course distributed over six months in three nightly sessions weekly at Kent State University. END

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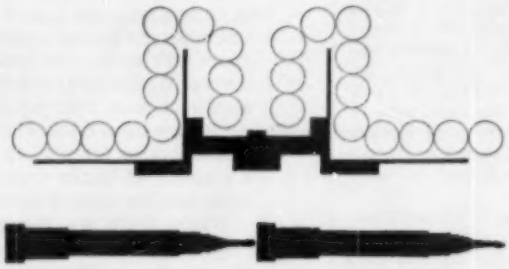
When completed, the entire passenger terminal development will represent an investment of $60,000,000 and could accommodate 140 aircraft at one time. The ten-passenger structures will have an aggregate floor area exceeding in size a combination of the new terminal buildings at San Francisco, Miami, St. Louis and Pittsburgh.

The Port Authority buildings were designed by the firm of Skidmore, Owings and Merrill.



The main building group will have a road frontage of 2200 feet. It is almost as long as two 1250-foot Empire State buildings on their sides end to end.

High-Performance Sailplane Kit

(Continued from page 34)

glider pilots, several structural and aerodynamic refinements have been made, most noteworthy of which is flush riveting on the wings.

At first glance, one tends to underestimate the capability of the 1-26, for it has none of the slim and graceful lines traditionally associated with high-performance sailplanes. In fact, using the time-honored criterion of aspect ratio as an index, it should have a relatively low-performance utility, since the aspect ratio of the 160-square-foot wing is only ten, far below that of many of the well-known utilities. Careful selection of the airfoil, and close attention to other details, however, has produced a design which requires only a single flight to demonstrate its claim for recognition in the high-performance field.

In the air, the 1-26 is entirely free of vices, with controls so well balanced for both high and low speed flight that it is not necessary to install a trim system. Rudder control, traditionally a weak point on single seat sailplanes, is positive and strong, thanks to a rudder mounted entirely above the fuselage where it can work in undisturbed air. The elevator, while appearing to be considerably undersize, is equally effective, due again to location, which places it above the wing downwash. Since it is below the rudder but above the fuselage, no cutout is required, another factor responsible for its effectiveness.

Because of the cantilever construction of the wing and tail surfaces, which eliminate drag-producing struts, and the very slight protuberance of the molded canopy, the 1-26 is very "clean." Maximum glide angle, which is determined by the overall lift-to-drag ratio of the whole machine, is 23 to 1. Translated into practical terms, this means that, from an altitude of one thousand feet, the 1-26 can glide nearly five miles. The speed at which this maximum glide angle is attained is 44 mph, and the rate of sink at that speed is three feet per second,—nearly five and one-half minutes to reach the ground from 1,000 feet. Gliders have several recognized "speeds," however, and the minimum sink speed is considerably lower, only two and one-half feet per second, or roughly 150 feet per minute. Cruising speed, which for gliders is considered to be the speed at which the rate of sink is six feet per second, is 70 mph.

These performances were verified by the author at the 1954 National Soaring Championships at Elsinore, Calif., where he flew the 1-26 prototype in direct comparison with the standard 1-23 model. At 50 mph, the two ships held perfect formation in straightaway flight. At increased speeds, the 1-26 sank below the 1-23, but when speeds were reduced to around 40 mph, the 1-23, with its high wing loading, sank below the 1-26. In tight circling flight in weak thermals, the low wing loading of the 1-26, only 3.13 pounds per square foot, coupled with the low aspect ratio, really paid off. High

(Continued on page 67)

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AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is "To make flying more useful, less expensive, safer and more fun."

Headquarters address is Box 5960, Washington 14, D.C. Members also receive a special AOPA edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

MORE ON VOR-DME/TACAN

Since reporting the VOR-DME/TACAN controversy here last month, AOPA has received numerous requests for more information about the dispute and an explanation of the many initials and technical terms involved.

Believing this is a matter of vital importance to all U. S. taxpayers in general and to everyone in civil aviation in particular, AOPA presents the whole story from the beginning and a resumé of the most recent developments.

Essentially here is the argument:

Omni (VOR—"V" for very high frequency radio, "O" for omni or many, and "R" for range) and distance measuring equipment (DME) are the basic radio navigation aids on which the U. S. airways system is built. They were developed by the Radio Technical Commission for Aeronautics—a government-aviation industry body concerned with development of devices and systems for air navigation.

Omni is static-free, offers a pilot 360 courses to fly to or from a station, shows him visually his course, is accurate to better than 3° and is easy to learn and to operate. Distance measuring equipment (DME) is a key part of the complete system.

The two devices are major parts of the system developed to replace the pre-World War II, four-course, low-frequency radio ranges which served the country's aerial highways for many years. Low-frequency ranges are not always reliable, because of technical problems and static interference which usually reduce their effectiveness in bad weather when they were needed most.

The omni-DME system was agreed to by both civil and military aviation leaders—thus deriving the name "Common System". Congress appropriated funds, and CAA went to work installing the new system. Civil aviation industries began developing the needed airborne receivers. The transition to omni-DME has been taking place—for all except the military.

Despite its commitment to the Common System, the Department of Defense did not convert its airborne equipment. Air Force, Army, and Navy pilots continued to navigate by the low-frequency ranges with low-frequency receivers and automatic direction finders (radio compasses). Consequently, even today, the majority of military pilots know little or nothing about omni and DME.

The Department of Defense did not make the step to the Common System, because it was developing secretly a system of its own called TACAN or "tactical air navigation." TACAN operates essentially like omni, but is claimed to meet the stated military requirement for 1° accuracy and utility aboard aircraft carriers—conditions that omni supposedly can't meet. However, TACAN has no voice facility for communications—which omni does have.

After many months and many millions of dollars expended on it, TACAN is still—the military admits—in a crude development stage, will require much more work and money before it can do what is claimed for it, and will not be finally ready for general use for many years. However, TACAN uses the same radio frequency range that the present civil DME uses. This frequency conflict and the military's contention that TACAN must be adopted—thus scrapping DME almost immediately and obsoleting omni within 10 years—"for the national security" are the roots of the controversy.

While this developing of systems was going on, the State Department and the Civil Aeronautics Board had already sold omni-DME to the International Civil Aviation Organization member countries as the future international radio navigation aid standard.

At the same time, the military, acting alone, had originated agreements with foreign military groups to make TACAN the international military system.

When news of TACAN's secret development "leaked" some months ago, the Air Navigation Development Board appointed a special committee called VORTAC (VOR for omni-DME, TAC for TACAN). It was composed of government and civil aviation representatives. Its job—study the two systems' merits and make recommendations to ANDB.

AOPA participated in the committee's work. From the beginning AOPA felt that the military position was arbitrary and improper. AOPA believed that the military made it clear that all aviation would have to take TACAN—like it or not—because Congress would not support two systems, and would naturally take what the military said it needed.

When the VORTAC committee voted its recommendation, the Army, Air Force, Navy, and the Air Transport Association (representing the scheduled airlines) voted for TACAN. The CAA, AOPA, and the National Business Aircraft Association voted to retain the present system until TACAN is proved, then consider its adoption.

The Departments of Defense and Commerce—the only agencies voting in the ANDB on the VORTAC recommendation—decided and subsequently recommended in February that TACAN replace omni by 1965, and that DME should be discontinued by June 30, 1955, except for experimentation. In voting for TACAN, Commerce "reluctantly" overruled its aviation agency—the CAA.

When the secrecy cloak came off the TACAN issue, AOPA immediately brought it to the attention of its 42,000 members, all members of Congress, key aviation industry officials, and the public press. AOPA contends that the military actions have been improper—some of the actions may yet prove a national scandal—and that doing things blindly, regardless of cost, because the military says they are for "national security" is a dangerous course to follow.

As results of AOPA's efforts, these developments have taken place.

1. Four Congressional committees are investigating or planning to investigate the controversy.
2. The State Department and the CAB have asked the military to explain its single-handed action in originating agreements contrary to civil agreements.
3. The General Accounting Office—watchdog of the U. S. Treasury—has been gathering facts on the battle.
4. CAA is fighting to keep DME past the June deadline and to keep DME funds in the CAA budget soon to go to Congress.
5. The Radio Technical Commission for Aeronautics has a planned investigation of the fight high on its agenda.
6. AOPA members have flooded their Senators and Representatives with demands for investigations.

Further developments and the outcome of the investigations will be reported in the AOPA official publication the PILOT.

"They make me nervous!"

(Continued from page 65)

aspect-ratio sailplanes suffer from high inertia due to their long wings, and are notoriously slow in getting around a turn. The short-span utilities have a great advantage over their higher-performance contemporaries in this respect, and at cost of only slight loss in performance at the high-speed end of the scale. The 1-26 retains all the tight-turning advantages of the lightweights. In the 1954 National, it placed ahead of *all* war-surplus types, which also are in the 23 to 1 glide range, and maintained a good lead over several of the high-performance types when conditions were generally poor.

On paper, the stalling speed of the 1-26 is a shade under 30 mph, but in practice it seems to be a few mph higher, say 35 mph to be conservative. Even without an airspeed indicator to go by, stall warning is every evident, as it is on most sailplanes. This is produced by the heavy wash-out of the wings toward the tips, which allows the center section to stall out while the rest of the wing is still unstalled. The resulting turbulence hitting the tail surfaces sets up a buffeting which is about as subtle as a sledgehammer. Aileron control is good right up to the point of complete stall, and the stall itself is not vicious. Spin recovery is rapid, and acrobatically-inclined pilots need have no worries about structural failure—the wings have been static tested to over 10 G's.

Choice of instrumentation rests entirely with the purchaser, as none is provided with the kit. The prototype was fitted with the usual basic flight instruments: altimeter, compass, a helicopter airspeed, and no less than *three* variometers, which are ultra-sensitive rate-of-climb indicators reading in feet per second. Many glider pilots use a standard rate-of-climb in conjunction with a variometer for an average indication during turbulent and strong-lift conditions.

In pilot comfort and convenience, the 1-26 is a great improvement over the "tailored" high performance single seaters of the past. Pilots weighing over 230 pounds get in and out quite comfortably even when wearing flying suit and parachute. With a large pilot in the seat, there is plenty of room for such extra equipment as radio, barograph, lunch and thermos, oxygen, and all other paraphernalia of soaring. The one-piece molded canopy provides excellent visibility upward, forward, and down, but leaves something to be desired in the critical upward-and-behind region. This could be remedied, however, by installing a transparent panel in the sheet metal fairing behind the pilot.

One recent innovation incorporated in the 1-26 is a pitot flush at the tip of the nose. While this is an aerodynamic advantage, it is also a great boon on the ground, since the attrition rate of protruding pitot masts due to careless spectators or ground handlers is considerable. Many a flight has been called off because of damage to this essential piece of equipment. Other features are more conventional. The spoilers, one on the upper surface of each wing, are mounted far enough outboard to have no effect on the tail surfaces when they are extended. The single wheel is located so as to place the loaded center of gravity slightly ahead of it, causing the sailplane to rest on the nose skid when on the ground with the pilot aboard. This provides a stable force arrangement much appreciated when making downwind landings. The center of gravity moves to a point behind the wheel when the ship is empty, but the weight at the tail is still light enough to make easy ground handling by one person. The standard configuration of the 1-26 does not call for rollers at the wingtip, but they can be installed for ease of ground handling when operating from paved airports. The kit itself is actually a semi-built machine and not just a batch of raw materials and a set of blueprints. All of the welding on the chrome-moly steel-tube fuselage is completed, leaving to the builder only the attaching of formers and stringers, the fabrication of seat and instrument panel, installation of controls, and covering. Parts for the aluminum-frame tail surfaces are all preformed, and require only a riveting together of the parts and covering. The wings, which are the most critical part of the machine and hardest to assemble, are

(Continued on page 68)

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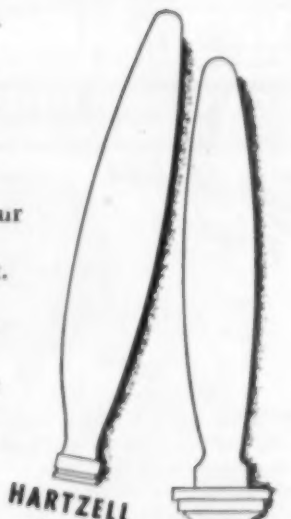

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(Continued from page 67)

almost entirely factory-built. The entire main spar and D-tube assembly is complete, as is the drag bay. Wing spar butts are drilled for attachment to the carry-through panel in the fuselage and all other essential alignments are factory-made, eliminating the need to set up elaborate jigging by the purchaser.

Schweizer estimates that a fairly skilled worker can complete the standard 1-26 kit in from 200 to 300 hours, while the less experienced can be expected to take up to 500 hours. Kit construction is a natural for clubs or groups of individuals, since there is no need to jig up and match parts. The various components can be worked on in widely scattered locations. Another advantage of kit design is the leeway available to the builder in cockpit layout and equipment. No engineering approval is required unless individual modifications affect structure or aerodynamic characteristics.

Except for the stressed areas of the wing, the D-tube and drag panel, all covering is fabric. Primer, fabric, and dope are supplied with the standard kit, but those who have their own sources of supply can obtain kits minus these materials, at reduced prices. If the purchaser so desires, additional work can be done on the kit at the factory, or the complete ship can be purchased ready-built. Because of the simplicity of the design and the absence of struts and fairings, setting the ship up in the field is a simple job. Trailering is greatly simplified in that the span of the horizontal tail has been kept below the eight-foot maximum, making it possible to put the fuselage on the trailer with the entire tail assembly in place. Trailer materials are not supplied with the kit, but purchasers who do not already have a suitable trailer can obtain plans for either a wood or a metal trailer from Schweizer at no cost.

Assuming that all of the kits now on order will be completed by their purchasers, the 1-26 is already the third most numerous glider model in the country, exceeded only by two of the ubiquitous war-surplus two-seaters. This will make it possible to hold "One Class" competitions at the various soaring meets throughout the country, something that has been impossible so far because of the lack of sufficient numbers of each model. Besides putting a number of new ships into circulation and permitting one-class competition, the 1-26 can be expected to boost glider training in general. The kit will replace many of the two-seaters now being used for personal pleasure, thus releasing them for their primary duty of two-seat training.

The 1-26 is the first American glider kit to be turned out on a production basis since before the war, and is the highest performance type ever made available in this country, in kit form. Delivery of the initial order of kits was completed in April. There should be a number of these intriguing new single-seaters at Elmira for the twenty-fifth National Soaring Contests, scheduled for late summer. END

FOR HOME-BUILDERS

IN ANSWER to the many inquiries received by the Experimental Aircraft Association for a simple easy-to-build and fly sportplane, Paul H. Poberezny, president of the association, purchased the old Corben Sport Plane Company of Madison, Wisc. a year ago. The Corben C-1 *Baby Ace* shown above is the result.

Available in kit or plan form, the *Baby Ace* will accommodate either Lycoming, Franklin or Continental 65-hp engines. The fuselage is of welded steel tubing construction and the wings are of all wooden construction. The entire plane is fabric covered.

Specifications of the prototype are: Span 25 ft. 9 in.; length 18 ft.; height 6.5 ft.; empty weight 569 lbs.; maximum speed 110 mph.; cruising speed 95 mph.; landing speed 30 mph.; range 300 miles; rate of climb 1200 fpm.

In accordance with the policy of the Experimental Aircraft Association, a technical committee appointed by the membership for the purpose of approving kit plans has fully investigated and approved the *Baby Ace* as conforming to good safety and engineering standards.

At the present time there are about 12 Corbens under construction throughout the country. Kits or plans are available from the Corben Aircraft Co., 3801 S. 56th Street, Milwaukee 14, Wisc.

—LEO J. KOHN

My Friend the Thermometer

(Continued from page 39)

tions present real problems of control for the pilot.

When turbulence becomes severe, it becomes dangerous. It exerts loads on the structure of the aircraft. Shearing stresses may also be encountered when opposite ends of the airplane are caught in opposing currents which, if strong enough, can disable the plane in mid-air. Thunderstorms are the result of strong vertical currents which, some weather observers believe, reach values as high as 200 mph.

With such facts in mind, a pilot flying a *Navion* from Cleveland to Milwaukee recently encountered a situation in which a temperature gauge aided him in reaching a safe decision. Shortly after passing over the Toledo range, his radio communications went out, due to a vibrator failure. However, as he was VFR, he continued on course. Flying at 4,000 feet, the ride was fairly smooth until he passed Goshen, Ind. Then the *Navion* began to buck and roll. After 20 minutes of this rough ride, he noticed that his passenger, an elderly lady, was feeling somewhat uneasy. Even though the pilot had slowed down the airplane to "rough air speed," it continued to bob about.

Noticing that the temperature was 70 degrees F. at 4,000, the pilot decided to try a higher altitude for smoother air. As the craft climbed to 5,000 feet, the temperature read 64 degrees F.; at 6,000, it indicated 57 degrees F. In 2,000 feet, the temperature dropped 13 degrees or an average of 6.5 degrees per thousand feet—and the air was still rough. This meant that temperature conditions favored vertical currents and the ride would become progressively rougher.

Once reaching this conclusion, the pilot then altered course and landed at South Bend, Ind. to check weather and have his radio repaired. He found that the morning's forecast had been revised. Thunderstorms were building up south of Chicago and drifting to the southwest. He was advised to wait on the ground for an hour, during which time conditions along his path of flight would clear. This he did, and the remaining leg of the flight was relatively smooth.

Another use of information supplied by the free air gauge, or strut thermometer, is to correct the readings of two instruments on the panel—the airspeed indicator and the altimeter.

In the case of the airspeed indicator, it must be corrected for variation from standard sea-level pressure and temperature. At higher altitudes and during the summer season, the airspeed indicator underreads because the air which operates it is less dense. (See Fig. 2.)

The simplest way to compute the correction is to use your Mark VII computer, or equivalent. Reading the temperature at the flight level of the airplane, this figure is then set up on the computer against the correct pressure altitude. Once this relationship is established, the indicated airspeed (or calibrated airspeed, if there exists a mechan-

(Continued on page 70)

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(Continued from page 69)

ical instrument error) is noted on the "minutes" scale. Directly above on the "miles" scale will be found the true airspeed.

The other instrument affected by temperature is the altimeter. This gauge is essentially an aneroid barometer which indicates altitude in feet instead of in units of pressure. An altimeter reads accurately only under one particular set of conditions, that is (a) the so-called standard atmosphere which assumes a pressure of 29.92 inches and a temperature of 59 degrees F. at sea level, and (b) at a certain temperature lapse rate of 3.5 degrees F. per thousand feet.

As such standard conditions seldom exist, the altimeter in an airplane usually requires correction. Especially when landing under conditions of poor visibility or low ceiling, it is essential that the pressure correction be made by adjusting the altimeter setting to the figures obtained from the control tower or range station.

Another altimeter error is due to nonstandard temperature conditions. Even though an altimeter is properly set for surface conditions, it will not be correct for higher levels. Depending upon the temperature, the altimeter can read high or low. The key fact to remember is that, if the air is warm, the indicated altitude will be less than the true altitude; if the air is cold, the indicated altitude will be greater than the true altitude.

How many feet can an altimeter be off? Well, it depends directly upon the temperature. A short time ago, a former Air Force pilot was flying his *Tri-Pacer* over the hot, dry desert of Texas and wondered what his actual height was above the ground (indicated altitude). To determine this, he collected his data. His pressure altitude was 5,000 feet and the air temperature was 76 degrees F. Below him the range station reported a ground temperature of 87 degrees F., and the sectional chart showed the ground elevation (or barometric altitude at ground level) to be 550 feet.

To get the indicated altitude, it was just a matter of subtracting the ground elevation from the barometric flight level altitude, or 5,000 minus 550 equals an indicated altitude of 4,450 feet. Once having this figure, he proceeded to compute the arithmetic mean temperature and the arithmetic mean barometric altitude by the formulae:

Mean Temperature = ½ (Temp. aloft + Ground Temp.)

Mean Barometric Altitude = ½ (Barometric flight altitude + Barometric ground altitude)

Or:

Mean Temp. = ½ (76 + 87) = ½ (163) = 82½ degrees F.

Mean Bar. Alt. = ½ (5000 + 550) = ½ (5550) = 2775 feet.

Then on the slide rule of the computer, the pilot set the mean air temperature opposite the mean barometric altitude. The indicated altitude was noted on the "minutes" scale and directly opposite on the "miles" scale is found the corrected altitude. With an indicated altitude of 4,450 feet, the corrected altitude was found to be 4,800 feet. The airplane was actually 350 feet higher than that reflected by the altimeter (see Fig. 3).

Contrast this situation to one in mid-January when the temperature is extremely low. While flying at 5,000 feet along the Ohio shore of Lake Erie, a Civil Air Patrol pilot noticed that the outside air temperature was 0 degrees F. He also had noticed that, while he was climbing to altitude, the lapse rate was near normal—3.5 degrees F. Under this condition, he did not need to compute the mean temperature and the mean barometric altitude. Directly he set the air temperature aloft opposite the barometric flight altitude on the slide rule.

Then, to determine the indicated altitude, he subtracted the shoreline elevation of 650 feet from the barometric flight altitude of 5,000 feet. This made the indicated altitude 4,350 and the slide rule showed the corrected altitude to be only 3,925 feet. The airplane was 425 feet lower than that reflected by the altimeter (see Fig. 3).

The outside air temperature also serves a purpose when flying in or through a cloud. If the temperature is above 32 degrees F. (freezing) there will be little danger of ice forming on the outside of the airplane. But if the cloud temperature is between 32 degrees and -20 degrees F., and contains super-cooled water, agitation by contact with an airplane will cause the super-cooled water vapor to freeze and form ice on the outside of the aircraft.

Likewise the temperature gauge will aid a pilot in recognizing conditions that develop "invisible ice"—carburetor ice. This internal ice is formed in the throat and around the butterfly valve of the carburetor, and is brought about by the basic function of the carburetor which is to change gasoline from a liquid to a vapor. This process requires considerable heat. A portion of the heat is supplied by the gasoline, but most of it is supplied by the air moving through the carburetor. As a result, the temperature of the air within the throat of the carburetor is lowered approximately 40 degrees. As a general rule of thumb, this means that anytime the outside air temperature—as read on a strut thermometer or free air temperature gauge—falls below 70 degrees F., the temperature of air in the throat of the carburetor could be at freezing or below.

It is easy then to understand that if there is any moisture in the air, it will be cooled immediately and develop into a build-up of ice on and around the butterfly valve of the carburetor.

So it is that, whether the temperature is high or low, the thermometer readings will be helpful when making decisions concerning flight conditions or instrument error. Tape a thermometer on your wing strut and utilize one of the most economical flight safety aids found today.

END

Perils of Space Flight

(Continued from page 32)

daylight familiar to us on earth. And also at this altitude, we encounter Dr. Strughold's acoustical border—the beginning of silent space.

The most spectacular of the space factors is the meteorite. Between 25 and 75 miles above the earth, most of the meteors are burned out by friction with the atmosphere. Above 75 miles, a rocketship is beyond the "meteor-safe wall." A meteoric hit on our sealed cabin would be like a localized explosion within the cabin wall. The size of the hole and the volume of the cabin would determine the speed of escaping cabin air. According to astronomers, the likelihood of being struck by a meteor is remote. Further, suggestions have already been made which would lessen the dangers of such an accident. For example, one suggestion proposes a second hull which would encase our space ship. Such a "space bumper" would absorb the force of collision and leave our sealed cabin unmolested.

All of the space-equivalents we have mentioned so far have one thing in common. They are each found at certain fixed levels of the atmosphere and their effects would be felt by a floating body stationed at the levels at which each of them occur. They are *static* space-equivalent conditions.

One important space-equivalent condition occurs within the atmosphere which is a direct result of our spaceship's own movement. This condition is called weightlessness, or the *gravity-free* state.

Even though the force of gravity decreases with the inverse square of the distance from the earth's center, we know that the situation is quite different with a vehicle in flight. Subgravity (negative G's) or zero gravity (weightlessness) can be produced at any altitude when the centrifugal force of the ship counterbalances the gravitational force. Such weightlessness is caused by our own motion; it is, then, a *dynamic* effect and not a static condition dependent on "so many miles above the earth."

Although weightlessness has nothing directly to do with the distance from the earth, indirectly it depends upon it with regard to how long it will last. The limiting factor to *duration* is the resistance, or drag, of the atmosphere. This drag factor is determined by both the density of the air and the speed of the aircraft.

At about 120 miles out, the density of the air is too low to produce any drag at any speed. This altitude is the functional border of the gravity-free state. Beyond it we have the space equivalent of permanent weightlessness.

Dr. Strughold discloses that despite the misconception of Russian space scientists who recently published an "original" paper based on their misunderstanding of a published American report, the 120-mile level is the *nearest possible* orbit for a permanent space station. This space station, or platform, is a man-made planet housing such necessary supplies as would be needed to refuel an interplanetary space ship. Any Soviet platform stationed at the proposed 110-mile level would, after perhaps a good many years, circle closer and closer to the earth until one day it would spin crazily in a free fall and end up a pile of ignominious Soviet scrap!

In addition to drag, high speed craft produce heat by friction with air molecules. This effect is known as the *thermal barrier* and has considerable effect on the climate within our sealed cabin. This thermal barrier also vanishes at the 120-mile level. Above this, our cabin climate will be subjected to solar radiations only.

With the presentation of these two dynamic functional borders, we may eliminate our concept of space-equivalents because now, at last, we are actually in *outer space!* This bold assertion should be tempered, however, with the assumption that we can ignore minor factors such as the bulk of the earth, its speed and magnetic field.

To date, manned rocket planes have penetrated at least three of our space-equivalents; animal carrying rockets have left nearly all of them behind! Unmanned two-stage rockets have penetrated deep into the heart of total space-equivalence! It will not be too long before piloted rockets will enter that region, too. Then the age of true space flight will be before us. "These are statements based on physical, technical, and physiological facts," states Dr. Strughold. END

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Tip Tanks for Your Airplane

(Continued from page 19)

curves of the airplane in its standard configuration must be plotted. To obtain this data by analysis is possible, but costly and time consuming. It is, therefore, necessary to obtain basic data from the manufacturer. Correlating this data with the calculated effect of the tip tank and fuel load, new curves are obtained. From these new curves of combined data a knowledge of the resulting forces is correlated with a structural analysis of the wings' strength. Potential weak spots, necessary beef-up and location and amount of load, are then checked in static tests.

If the gross weight of the plane is to be changed, then the basic data changes and an entirely new problem enters the picture. Here an analysis of the entire airplane is necessary.

Design and installation of tip tanks becomes the next phase. This includes the tank, its attachments and wing rework. All must be static tested with calculated loads applied to the tank and its attachments. The tank itself must be designed to meet CAA basic requirements, including such ambiguity as "amply tested." One such is a vibration and "slosh" test of the tank and its attachments, wherein the tank, filled two-thirds with water, is rocked 15° above and below a horizontal plane 30 times per minute while simultaneously being vibrated at specified degrees of movement. Fuel lines must supply a prescribed rate of flow.

With the aforesaid accomplished and determined safe for flight test, a program is begun. An irreversible flutter of the aileron or other structures is possible by changing the wing loading or distribution of forces in the wing. Therefore, this condition must be thoroughly investigated. Flutter analysis, a costly and time consuming study, may reveal the likeliness of its occurrence. However, ultimately a flight test with empty, partially and completely filled tanks must be made by flying the craft at V_d, which is the maximum designed speed of the aircraft, 10 per cent above red line. While flying at this speed extreme gyrations must be made, with considerable force being placed upon the ailerons to simulate turbulence.

The effect of unequal fuel loads upon the stability of the airplane must also be observed and, if critical, steps taken to correct same. In this respect, the plane is flown with one tank completely filled and the other empty, power on, power off, stalls, gear up, gear down, flaps up, flaps down, etc.

Spins, with partially and completely full tip tanks, must be investigated to determine effect of the centrifugal force of the mass at the wing tip. Here the plane must have adequate inherent directional stability, or steps taken to add enough directional stability to comply with requirements under which the craft was originally licensed.

Recovery from roll, trim tab effectiveness, stability, rate of climb—all must be flight tested and meet basic CAA standards.

After completing the entire project, and only then, is one able to determine for certain whether or not it is worth starting. An evaluation before and after should include the following:

SAFETY Obvious reduction of fire hazard is automatically obtained. Adequate margins of strength are established by engineering analysis and proven by static and flight tests. A wing must present sufficient inherent margins of strength so as not to require rework out of pro-

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(Answer on page 79)

portion with end results. Under certain flight conditions a wing-tip load is a relieving force to prevent the wing from upward bending, as in pulling out of a dive or in rough air, but all conditions must be considered.

STABILITY can be increased with proper installation. The mass at the wing tip, represented by the weight of the fuel, will decrease the rate of roll, like a tight rope walker with his weighted pole. This feature is particularly noticeable in rough air. However, the mass may be too large, in relation to the effectiveness of the aileron, and once roll has begun, it may be difficult to stop—hence, an optimum amount of fuel and flighttest proof.

CONTROLLABILITY must . . maintained. A possible force resulting from complete asymmetry of fuel must be less than the maximum obtainable force from the aileron. Directional control may decrease if the vertical component of the tank is too great, either by virtue of its diameter being too large, or its shape, if elongated from top to bottom.

This factor was taken into account in the design of the Cessna "310," with its vertically elongated tanks, by building in the necessary compensating directional control in the vertical stabilizer and rudder.

With an existing plane to be modified however, it must be remembered that any object placed in the line of flight that has a vertical component, and which lies forward of the center of action, or pivot, of the yaw axis, will decrease the effectiveness of the vertical stabilizer and rudder. Theoretically, an ordinary playing card, if placed far enough forward of the nose of an airplane, could turn the airplane about and become the tail surface. With optimum shape and diameter tanks, this factor may be minimal and spin recovery and yaw tendencies unaffected. In rough air with full tanks, again the rate of yaw is dampened and an apparent stability results.

LIFT is increased as a result of several factors. Actually the aspect ratio, and thereby life, is increased if the tank is placed on the end of the wing. Further increase in lift is provided by the end-plate effect of the tank at the wing tip, which helps to prevent air spilling off the tip. This spilling of air not only accounts for some loss of lift but also causes a burble at the wing tip, which results in drag. The degree of end-plate effect obtained will depend upon the height of the tank and its position on the wing tip.

The tank itself can provide a certain amount of lift, depending upon its configuration and the angle of attack designed in its mountings. The combined results may be expected to be most beneficial at higher angle of attack, as in climbing, and at high altitude, where relatively more air is passing over the wings. It is this increase in air flow which would be expected to provide some increase in aileron effectiveness at lower speeds.

RATE OF CLIMB can be expected to increase as a result of increased lift. This is particularly true at higher altitudes

(Continued on page 74)

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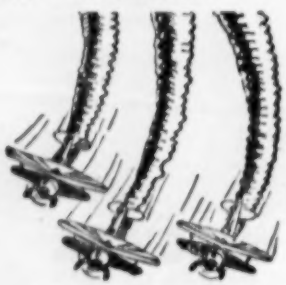

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(Continued from page 73)

where, for example, on the *Navion*, an improvement of 135 feet-per-minute rate of climb was recorded with tip tanks, as compared with the standard configuration. If the gross weight were to be increased, this increase in rate of climb might be necessary to meet CAA requirements relative to performance of the given aircraft.

CRUISING SPEED at lower altitudes is affected very little by the aerodynamics of properly designed and positioned wing tip tanks. At higher altitudes, however, an increase in cruising speed, and power for power speed, may be expected. This is a product of the increased lift and decreased drag at the wing tip, for at higher altitudes, the inherent drag of a properly designed tank may be less than the drag of the conventional wing tip. An attempt to predict these results necessitates an analysis of the drag of the existing wing. Only flight tests provide the final answer.

ON THE STEP PERFORMANCE may provide considerable increase in cruising speed and in acceleration in the air. This is dependent, however, upon the tip tank load being accurately located upon the center of gravity. Here, again, the pre-modification flight characteristics must reveal the craft to be sensitive to aft loading with mushing to expect a noticeable improvement by shifting additional weight of auxiliary fuel forward to the center of gravity.

Inasmuch as all of the above factors are variables, one can assume that it is possible to put wing tip tanks on any airplane. This is probably true.

However, the structural and aerodynamic considerations may necessarily restrict the size of the tank and its capacity to a point where the installation has nothing to offer when completed. In other instances, the load-carrying ability may exceed the requirement. There are many civilian aircraft in the air today that would lend themselves to this modification.

Each type of aircraft, however, necessitates an independent, costly and time-consuming program of engineering and testing to assure safety and to evaluate the change in flight characteristics and performance. **END**

First Cross-Country of the A3D

(Continued from page 33)

Rain was not likely, but crippling-fog was a night-to-night hazard. Representatives of the telephone company sat in on the final details. With them were supervisors from the gas company, the street car lines, the railroads, and the Department of Water and Power.

In a separate conference, checking over the route, were representatives of the Los Angeles Police, the Los Angeles County Sheriff's Department, the California Highway Patrol, the Burbank City Police, the San Fernando Police, and the Douglas Company's Security Police. The timetable was set, and every effected person alerted.

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POPULAR PHOTOGRAPHY — 1/1/56

tion of the Truck Company had been doing its share. The prime carrier selected was a big gooseneck dolly trailer with 16 tires. It was strengthened three times over to carry the enormous load. The gooseneck was hollowed-out and a deep "well" fashioned to receive the nose wheel of the airplane. On either side of the lowbed, massive channel irons were built up to receive the main landing wheels of the A3D.

Over the smooth city street, a ten-wheel tractor would suffice to pull the load. On the mountain grades, a second tractor was to be hitched on to keep a steady, even pull on the toughest grades. The driver in the foremost tractor was nearly 100 feet ahead of his rear wheels. And the tail of the plane extended even further back. Employees of Belyea who were to make the trip were cleared through Navy Security. The plane itself was draped entirely in heavy drop cloths. To curious eyes the monstrous object had the shape of an airplane—no more.

During daylight hours of one Sunday, a ramp was built up the rear of the trailer, and the airplane winched to its resting place on the low bed. Giant guy wires were stretched from various spots on the plane to eyebolts on the lowbed, lashing it securely. Red warning flags fluttered from the guy wires, and the whole rig assumed a circus air.

Shortly before midnight, eight escort cars lined up around the aircraft. Three formed a flying wedge immediately before the plane. One took station under each wing; and three formed a wedge behind the tail. The number of motorists in Southern California who have rammed head-on into slow moving objects is legion. The number of workmen who have been killed or injured while accompanying slow-moving objects is considerable. If any motorist was determined to get killed that night, he would plow into an escort car. The airplane was to remain undamaged. To make it doubly hard for some near-sighted driver to pile into the multi-million dollar project, every escort car was equipped with blinking neon lights. The accent was to be on safety every foot of the way. Time meant nothing.

High on the extreme end of each wing a workman perched, in his mouth a whistle, in his hand a flashlight. His the delicate job of signaling clearance from overhead wires, a good many of them charged and deadly. The chain of command, on encountering an obstacle, was from the workman on the wingtip to the escort car just beneath his feet, and from that car to the tractor driver far ahead.

Exactly at midnight, the first escort moved out into the street adjoining the Douglas plant. The entire line of march was notified. The aim was to maintain a smooth, even flow through the 30 miles of city street and to be out in open country, beyond San Fernando, with the coming of dawn, six hours later. To keep that pace, it was necessary for obstacles to disappear before they were encountered.

A light pole was the first to be marked for removal. Before the blinking lights of the escort cars were in sight, the working crews of the Power and Light Company,

(Continued on page 76)

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(Continued from page 75)

alerted by telephone, had killed the juice, disconnected the wires, pulled the pole, and slipped into a side street to let the procession go by. The last escort car had scarcely cleared when the crew reset the pole, restrung the wires, restored service, and raced ahead to the next marked pole. Two other power poles were jerked from the path of the rolling aircraft. A signal arm was disconnected, and the support post whisked away. A telephone pole met the same fate. Inching over railway tracks, the procession went by a crossing signal flat on the ground awaiting the passing of progress.

On several occasions when right turns were being made in some of the undeveloped sections of the city, the huge vehicle was forced over to soft shoulders. Massive plank beds were laid to carry the weight. The safety islands so prevalent in the middle of Los Angeles' streets presented the worst headache. Twenty-seven pieces of 6 x 8 cribbing were required to ramp the trailer wheels over the islands. Up in front of the escort cars, a tree-trimming crew sawed at branches that came too close to the shrouded wings of the aircraft. Some trees were sawed down completely. Accompanying the procession was a truck loaded with coffee and sandwiches.

The city crossing was completed without incident. The first long pull over the Ridge Route came with the warm sun in the morning. The second tractor was hitched on, and the aircraft rolled. Traffic snarled and unsnarled, and the plane rolled on. It continued circling through the mountains until nearly darkness on Monday night. At a turnout, the procession finally halted. Security guards were posted on the aircraft, and the entire crew slept in a nearby motel.

At seven next morning, they were underway again. Twelve hours later, on time to the minute, the aircraft was delivered to the United States Navy. Never would an A3D again cover 171 miles so low and slow. END

FLYING CALENDAR

May 26-30—Wright Memorial Glider Meet, Dayton (Ohio) Municipal Airport. Write The Soaring Society of Dayton, Dayton, Ohio, for details.

May 28-30—Second annual Hayward-Tucson Air Race sponsored by 20-30 Clubs of Hayward, Calif. and Tucson, Ariz. Race is open to stock aircraft under 300 hp. $1500 in prizes. Write Leo Perry, Co-ch., Tucson 2d annual Air Race, Hayward Municipal Airport, Hayward, Calif.

May 28-30—Annual Eastern States Soaring Championship Contest at Wurtsboro, N. Y. sponsored by Metropolitan-Airhoppers Soaring Assn.

May 30—Decoration Day Air Show, Wagner, South Dakota.

May 30, June 11, Aug. 20—Britain's National Air Races. Contact: Royal Aero Club, 119 Piccadilly, London W. 1, England or Civil Air Attache's Office, British Embassy, Washington, D. C.

June 5—National Flying Farmers Transcontinental Flight.

June 5—Hector Flight Breakfast, sponsored by Hector (Minn.) Ch. of Comm.

June 9-14—Sixth All-Women's International Air Race from Washington, D. C., to Havana, Cuba. Chairman, Dorothea M. B. Vermorel, 1015 Olympia Bldg., Miami, Fla.

June 10-19—Paris Aero Show, at Le Bourget Aerodrome.

June 11-12—Lewis and Clark Sesqui-Centennial Flight, Missoula, Mont., to Astoria, Ore. Contact C. B. Moore, Walla Walla (Wash.) Chamber of Commerce for details.

June 11-12—Third Annual Steak Flight at Ranchaero Airport, Chico, Calif. For details, contact Myron L. Aitken, Butte Cy. Sheriff's Aero Sq., Chico Flying Club, Chico, Calif.

June 11-12—Seventh Annual New England Air Tour, Bar Harbor Airport, Bar Harbor, Maine. Clambake, cocktails, dancing, overnight accommodations—$8 per person. Contact Chamber of Commerce, Bar Harbor, Maine.

June 12—Pilot's Proficiency Contest at Graham Field, Route 8, Butler, Pa. Rain date, June 19. Contact: C. E. McKee, Jr., 210 Park Bldg., Pittsburgh 22, Pa.

June 13—Re-union of veteran pilots and other aviation personnel who operated out of Teterboro (N. J.) Airport prior to World War II. Luncheon and tour of field. Contact Russ Brinkley, WHP-TV Harrisburg, Penna.

June 13-14—Annual "Skylady Derby" air race for women pilots sponsored by Women's National Aeronautical Assn. Contact entry chairman, Mrs. Ruth Nickell, 904 Nickell Rd., Topeka, Kans.

June 18—Arabella, Mystic White Heron of the Trinity, invites you to the Annual Fish Fry, Anahuac, Texas.

June 18-25—Third Annual JayCee Transcontinental Air Cruise, Palm Springs, Calif., to Philadelphia, Pa. Contact Phila. Jr. Ch. of Commerce, 17th & Sansom St., Philadelphia 3, Pa.

June 19—Spring Air Show at Warren Cy. Airport, Glens Falls, N. Y., sponsored by Glens Falls Ch. of Com. and the Flying Twenty Club, Inc., John Johnson, pres. and ch. of arrangements com. Rain date: June 26.

June 26—Second annual Ranch-Style Flying Breakfast, Bluffton Airport, Bluffton, sponsored by Bluffton Flying Club and Bluffton Business Men's Ass'n.

July 2-6—Ninth Annual All-Woman Transcontinental Air Race, Long Beach, Calif. to Westfield, Mass. Contact Mrs. Betty H. Gillies, Chairman, at Box 5336, East San Diego, Calif. for details.

July 2-14—National Soaring Contest, Elmira, N. Y. This is 25th anniversary of the National soaring meets and also of all soaring at Elmira.

July 4—Dawn Patrol Flight. Clinton Woolsey Memorial Airport, Northport, Mich. Boating, golf, prizes.

July 17—Breakfast Flight, Ellensburg, Washington.

Aug. 5-7—Annual Fly-in of Experimental Aircraft Assn. Curtiss-Wright Airport, Milwaukee, Wis. Contact Paul H. Poberezny, 3801 S. 56th St., Milwaukee 14, Wis.

Aug. 15-20—National Flying Farmer Convention, East Lansing, Mich.

Calendar items must be received at FLYING's editorial offices, 366 Madison Ave., New York 17, N. Y., three months prior to the event.

Cars Take the Sky Road

(Continued from page 43)

varying from 20 minutes to 35 minutes in flying time, are now in operation. On the shorter, it is hardly worthwhile to unfasten the seat belt after take-off, and there is barely time to glance at the sea, chat a minute with a fellow-passenger and purchase a few duty-free cigarettes over the Channel before it is time for let-down.

Significant of the growth of the car ferry business is the fact that the air route we took from Lympne to Le Touquet has since been replaced by a route to Le Touquet from Ferryfield, the new Silver City air terminal. The opening of Ferryfield near Lydd, on Dungeness, on July 13, 1954, began the operation of the first new civil airport to be contsructed in England since 1944. Built in less than six months at a cost of $700,000, Ferryfield is also the first airport in the world designed specifically to serve vehicle traffic. The final car-carrying flight from Lympne in October 1955, brought to a close an operation which had made Lympne one of the busiest airports in Europe. Since 1948 Silver City had made 33,500 landings and take-offs at Lympne. The final flight was commanded by the co-pilot of the first cross-Channel ferry service flight, a veteran of over 5,500 Channel crossings.

Three months after its opening, Ferryfield was already handling more freight than any other airfield in the country. Of all freight handled at British airports during the month of Ferryfield's opening, 70 per cent took the form of vehicles and freight flown to and from Ferryfield, Lympne and Southampton. These three airfields were handling more than twice as much freight as the other forty U. K. civil airports put together.

Communications equipment at Ferryfield includes a Decca 424 airfield control radar, capable of locating and identifying aircraft up to 16 miles. A similar Decca installation will soon be made at Le Touquet, across the Channel so that it will be possible to track Silver City aircraft over the greater part of the total cross-Channel routes. An M/F directional beacon is also in operation at Ferryfield and three VHF transmitters and receivers. Night flying equipment includes a sodium-light funnel approach to the main runway and runway lights at 60-yard intervals.

The restaurant at Ferryfield is under supervision of Graham Lyons, who operates England's first motel near Lympne and who plans to open one at Ferryfield this year. Any one familiar with the tradition of old English inns will understand what an innovation is the motel system to England. A visit to the attractive Lyons motel near Lympne Airport before our trip across the Channel proved an interesting surprise. The motel looks like something straight out of Arizona and is modern and American in appearance except for one concession to British custom —an automatic tea-making machine by the bedside so that a guest may have his early cup of tea before rising.

In addition to the regularly scheduled

(Continued on page 78)

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(Continued from page 77)

car ferry service, Silver City Airways runs a lively charter service. S. C. pilots are surprised at nothing in the way of cargo; horses, flowers, pigs, a wrecked *Dove* airplane, racing pigeons and a dismantled *Canberra* have been among the varied cargos in the past. The NATO furniture from 216 office rooms in England was ferried to France by Silver City when the Paris office was opened. The majority of French and Irish horses which compete in English races are flown by Bristol *Freighters*. In 1951 the Berlin Senate made arrangements for a Silver City freight service between Berlin and Hamburg, an operation which continued until early 1954. More than 9,000 hours were flown in Germany.

Curiously enough, the unique cross-Channel air ferry got its start from a British mining venture. The name was derived from the town of Broken Hill in New South Wales, which, because of its once-rich silver deposits, is known as "The Silver City." In 1946 an Australian mining company, operating at Broken Hill, formed its own airline with three *Lancastrian* planes to carry executives all over the world and called this airline Silver City Airways. After two years the mining interest in the airline was bought by Britavia Ltd., a British aviation company which had been appointed to manage it. By this time the national airlines had recovered from war sufficiently to supply passenger transportation, and there was intense rivalry among private airlines for the small amount of charter traffic available. If Silver City was to prosper, it needed to find a unique type of service.

Geography is responsible to a large extent for the success of Silver City Airways. A body of water over which there is necessary travel offers a natural situation for an air car-ferry service. Yet geography alone could not account for the success of this business without ingenuity and an energetic effort to meet public demand.

A glance at the map of the U. S. makes one wonder that there is no similar service in certain rather obvious places here. The Great Lakes region offers several routes where such an air ferry service would be of considerable convenience. Possibly one reason why no company here has tackled the job is the fact that American cars are much bigger than most European cars, and bicycles and motorcycles, which contribute considerably to the volume of business for Silver City, have a limited use here compared with that of England or the Continent. A look at the coast of Florida, however, makes one wonder why nothing has been done about the Florida-Cuba route or some of the islands to the south. END

Pole to Pole

(Continued from page 29)

altitude of the Antarctic continent, the South Pole itself is in the substratosphere. From off the polar plateau, altitude 10,000 feet, hurricane winds constantly sweep over the massive mountain ranges, northward to the Antarctic Ocean. Right on this plateau is believed to be the breeding ground of a good deal of our southern hemisphere weather.

Scientists selected to serve at the most southerly point in the world must be prepared to face temperatures of 100 degrees below freezing. In the crystal clear air of Antarctica, you can see an incomparable distance. However, without warning comes the hurricane and there is a whirling world of white oblivion for unwary explorers. In the region of the Shackleton iceshelf in 1951 —when the *Discovery II* was making a reconnaissance of the region at the height of the antarctic summer, we experienced hurricane force winds every fourth day.

No plans have been announced for long-range air exploration of the antarctic hinterland. The heart of Antarctica —an area of 4,000,000 square miles—has never been seen by human eye. This unknown region is larger than the continent of Europe. An expedition in 1947 discovered that the Queen Maud Mountains ran into this vast unknown. Pilots estimated that some peaks were 18,000 feet. The possibility exists that peaks beyond rise higher than Mount Everest.

Two methods are being discussed for probing this hinterland. One is to use very long-range planes flying between established airfields in Africa, South America, New Zealand and Australia. The other is to operate long-range planes from Little America. The previous expedition there used DC-3 aircraft, the range and altitude of which were too limited to reach the continent's heart. Now ski-wheel landing gear is available for truly long-range aircraft, enabling them to take off on a hard surface runway and land on snow. With such planes available, it would be possible, for the first time, to fly between Little America and other continents. The American vessel, *Atka*, now on the job fitted with three helicopters will examine the old camps at Little America during 1955. She will then cruise around Graham Land to

NEW LOOK

CAA has requested opinion from plane owners about the proposed use of 12-inch high numbers on the side "of the fin or rudder" for easier checking by jet interceptors. Here is how they would look on a *Tri-Pacer*.

examine a possible alternate base site at the head of the Weddell Sea. The following season, during the southern summer of 1955-56, the main American base will be set up. Late in 1956, it is planned to set up the two advanced bases. Before the winter night, fresh teams of observers will be flown in and remain there until the end of the year of world-wide observations early in 1958.

The journey of the ice-breaker, *Atka*, to Antarctica is the first step in the entire three-year plan to probe other, as well as weather, secrets of the ice-age continent. One such other goal will be to find out whether or not low-lying coastal areas of the world face inundation in the near future as a result of polar thawing. Some scientists anticipate such a danger may arise within 25 to 50 years.

With highly sensitive instruments for recording the intensity of cosmic radiation, scientists in Antarctica also will gain information of enormous value in the Space Age. Cosmic rays, the mysterious bullets from outer space, might well wreck man's first attempt to leave his own planet for a journey into the regions beyond. International rivalry in the South Polar regions will advance man's ability to conquer the distance between his own world and those other worlds now coming within the ambit of his knowledge and interest.

Weather information from the South Pole station in 1956-7 will be of enormous value to the probable future trans-antarctic air route between South America and Australia. What goes on at an altitude of 20,000 above the antarctic ice-cap is reproduced at more than double that height in the equatorial regions.

Here in Australia a new expedition has set out from Melbourne for relief of the Mawson Harbor weather station, and faces one of the most difficult tasks ever set an antarctic project. The leader of the party, Mr. John M. Berchervaise, 44-year-old Geelong educationist, and his 14 followers, will be the only expedition in Antarctica without air support.

Argentina has marshalled 1,000 men in a task force for a four months scientific and exploratory expedition. In the force are transports, tankers, tugs, an ice-breaker, planes and helicopters.

As the months go by, and country after country moves to fulfill its part in the over-all campaign, we are sure to see new examples of heroism. Probably we shall think of it as the eternal romance of exploration and adventure which has ever gripped the imaginations of men . . . and discount it at that level.

Yet in our time, we well may see the efforts of these next three years translated into knowledge that vastly affects the destiny of every one of us. Let us then keep more than a casual eye on gleanings of reports which flow out of that forbidding land to the south. Remember it is not a "spot" but a vast continent of unique formation and it is unthinkable that its significance will remain small as its secrets are unfolded.

END

Answer to WHERE AM I? (Page 72)
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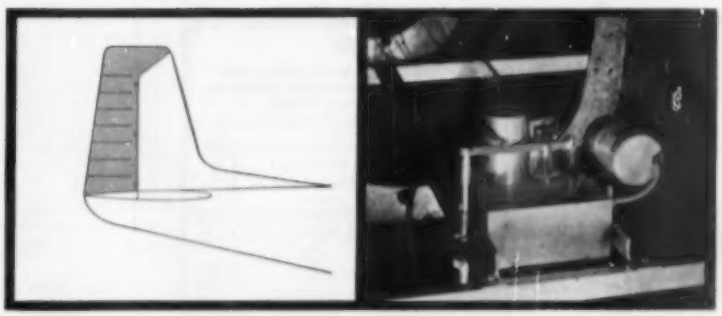

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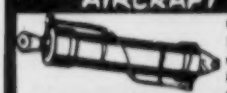

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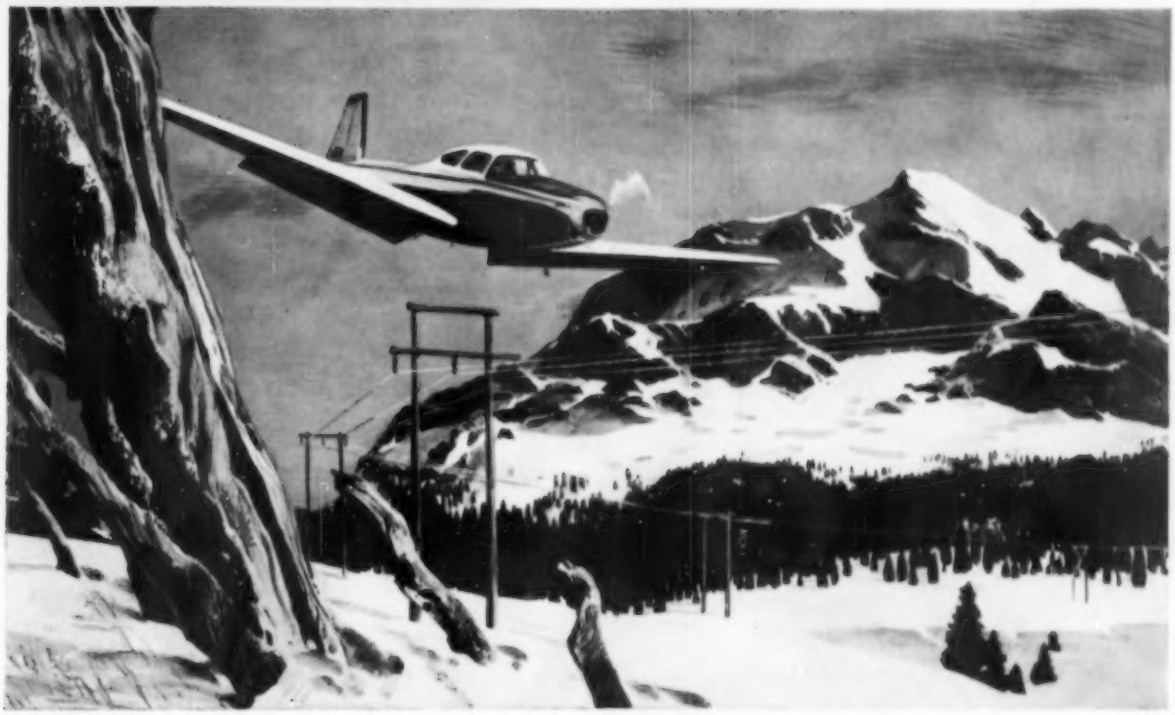
PLANE FAX

Your Best Week-end Flight Plan for June

Fly to the Golden Rose Ski Festival at Mount Hood, June 12, the last tournament of the season. Plan to land at nearby Hood River Airport, Oregon, for quality Standard Aviation Products and service.

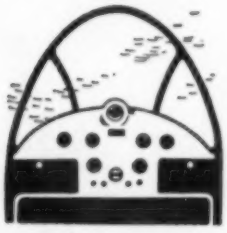


Riding power lines over Idaho mountains

A month's work in an afternoon! Flying at power-line level, over mountains and through valleys, Glenn Higby patrols 375 miles of line in 5 hours. He skims over broken terrain that used to take weeks to cover by trucks and on foot —but he's back the same day at his home port, Bradley Field near Boise.

"I keep the flaps one-quarter down for stability," he says, "and hold the prop in full low pitch. After that there's no trick to following the ground contour, as long as we have plenty of power in reserve. I always use Chevron Aviation Gasoline 80/87, because it gives me all the extra power I need, every time I need it. It ends plug fouling too—it's the most dependable fuel I've ever used.

"You'd think this kind of low-speed, high-power flying would be tough on engines, but we've had no trouble in the three years we've used RPM Aviation Oil. It cured the trouble we'd had with pre-ignition, and it gives us at least 200 extra flying hours between overhauls. 'RPM' really keeps rings and valves clean, right up to overhaul time. We never use anything else, in any of our planes."



TIP OF THE MONTH

If there's a chance of flying into weather, it's wise to refer to your instruments often. Then it's easy to shift over to instruments in a hurry.

T. M'S "RPM," "CHEVRON," "PLANE FAX," REG. U.S. PAT. OFF.

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